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CHIMIA

Herbstversammlung 1998
Assemblée d'automne 1998

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NOUVELLE SOCIETE SUISSE DE CHIMIE
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Philippe Renaud
(Univ. Fribourg, CH)
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Barry M. Trost
(Stanford University, USA)
April 7, 1999

Hisashi Yamamoto
(Nagoya University, Japan)
May 5, 1999

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The Novartis Chemistry Lectureship is set up to recognize the outstanding contributions of academics in natural product synthesis and the development of synthetic methodology

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CHIMIA 52 (1998) Nr. 9 (September)

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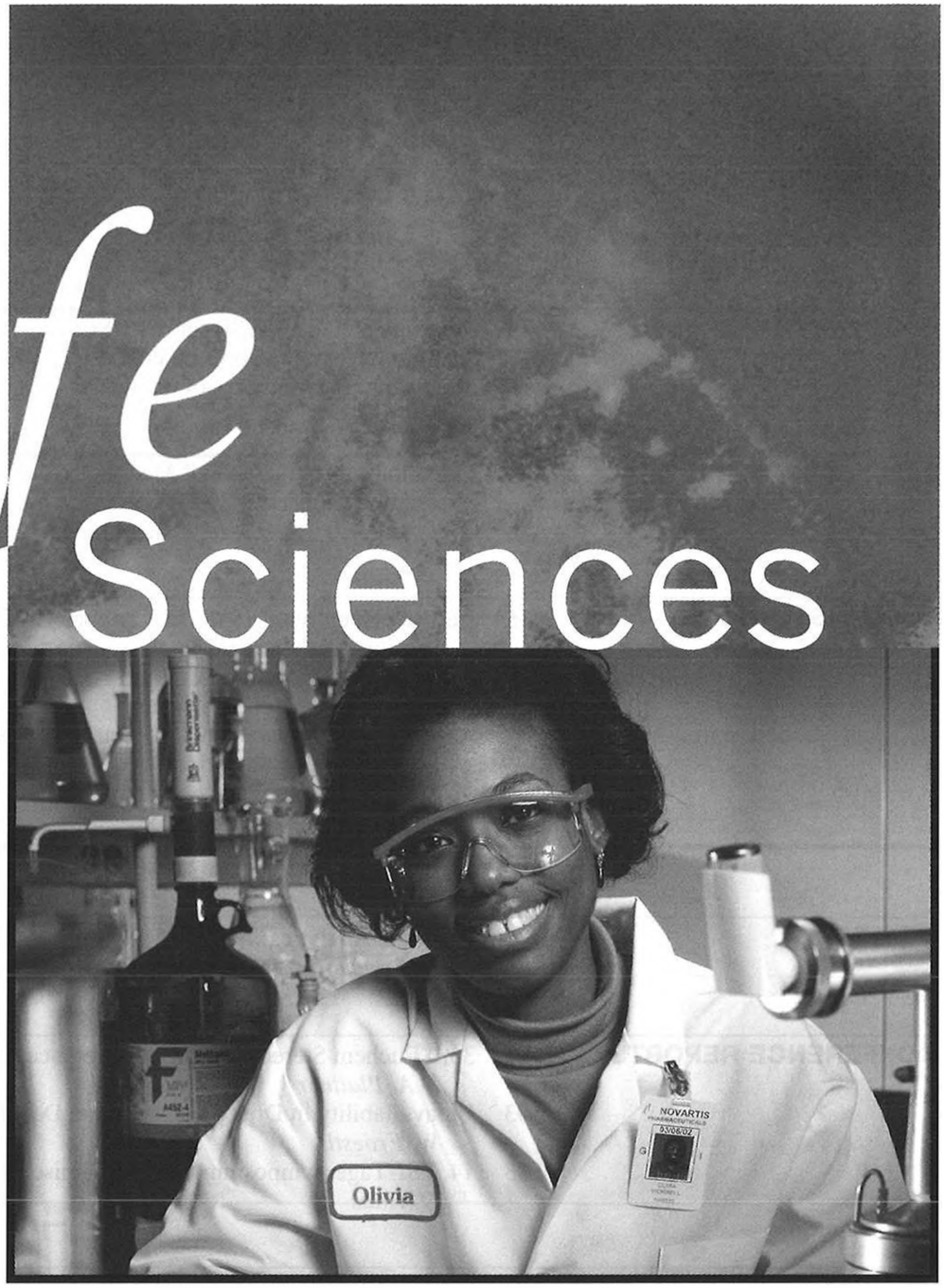

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Mitteilung an die Mitglieder der NSCG

Am 30. Juni dieses Jahres hat unsere Gesellschaft (NSCG) ihren Aktienanteil (52%) am Verlag Helvetica Chimica Acta AG (VHCA) an die Wiley-VCH Verlag GmbH (WILEY-VCH) verkauft. Seit 1. Juli 1998 ist somit WILEY-VCH alleinige Aktionärin von VHCA, da sie bereits 24% des Aktienkapitals besass und auch den Anteil von Birkhäuser+GBC AG (24%) erwerben konnte. Der Verkauf unseres VHCA-Aktienanteils wurde schon seit mehr als einem Jahr vom Vorstand unserer Gesellschaft diskutiert und vorbereitet. Dabei wurden mehrere Varianten in Betracht gezogen. Auch wurden Gespräche mit mehr als einem Verlagshaus geführt. Der Vorstand entschloss sich zu diesem Schritt, vor allem nachdem der VHCA Verluste erlitten hatte. Dazu kommt, dass heute das Verlagswesen weltweit grossen Veränderungen unterworfen ist, dies auch wegen des zukünftigen elektronischen Publizierens. Eine Gesellschaft wie die unsere kann die technischen Probleme und vor allem die kommerziellen Aspekte nicht mehr selbst erfolgreich bewältigen.

Die Zeitschrift ***Helvetica Chimica Acta*** bleibt bestehen und wird von WILEY-VCH herausgegeben werden. Vertraglich ist auch festgelegt, dass die NSCG ein Kuratorium zusammenstellt, das die wissenschaftliche Ausrichtung der Zeitschrift festlegt.

CHIMIA wird vom Verkauf unseres VHCA-Aktienanteils nicht betroffen. CHIMIA bleibt Eigentum der NSCG. Diese Fachzeitschrift, die vom *Chemical Abstracts Service* und dem *Science Citation Index* referiert wird, verfügt heute bei NSCG-Mitgliedern und Abonnenten sowohl im In- wie auch im Ausland über einen grossen, stetig steigenden Grad an Beachtung und Akzeptanz. Dazu kommt, dass CHIMIA das offizielle Publikationsorgan der NSCG und ihrer Sektionen ist.

H. Luzius Senti, Präsident

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NOUVELLE SOCIETE SUISSE DE CHIMIE
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Information aux membres de la NSSC

Au 30 juin de cette année, notre Société (NSSC) a vendu sa part d'actions (52%) de la société Helvetica Chimica Acta AG (VHCA) à Wiley-VCH Verlag GmbH (WILEY-VCH). Depuis le 1er juillet 1998, la maison WILEY-VCH en est ainsi la seule propriétaire puisqu'elle possédait déjà 24% du capital-actions et a en outre acquis la part de Birkhäuser+GBC AG (24%). Notre Comité de Direction a discuté cette vente pendant plus d'une année. Plusieurs variantes ont été prises en considération, et le Comité a eu des contacts avec plusieurs éditeurs. Il s'est finalement résolu à cette solution après que la VHCA ait présenté des pertes. A cela s'ajoute qu'aujourd'hui l'édition est soumise à des transformations importantes, en grande partie à cause des nouveaux moyens électroniques. Une Société comme la nôtre n'est plus en mesure de maîtriser les aspects techniques et commerciaux d'une telle tâche.

L'existence de ***Helvetica Chimica Acta*** est donc assurée. Le journal sera publié par la maison WILEY-VCH. Il est convenu par contrat que la NSSC continuera à en déterminer la direction scientifique par l'intermédiaire d'un Conseil de rédaction dont elle choisira les membres.

CHIMIA ne sera pas touché par la vente de notre part d'actions VHCA. CHIMIA reste propriété de la NSSC. Ce journal, auquel référence est faite par le *Chemical Abstracts Service* et le *Science Citation Index*, est de plus en plus apprécié par les membres de la NSSC et par les abonnés tant en Suisse qu'à l'étranger. En outre, CHIMIA est l'organe officiel de la NSSC et de ses sections.

H. Luzius Senti, Président

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NOUVELLE SOCIETE SUISSE DE CHIMIE
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Message to the Members of the NSCS

On June 30 of this year, our Society (NSCS) sold its shares (52%) of Verlag Helvetica Chimica Acta AG (VHCA) to the publishing company Wiley-VCH Verlag GmbH (WILEY-VCH). Thus, since July 1, 1998, WILEY-VCH is the sole owner of VHCA. WILEY-VCH already owned 24% of the shares before the purchase and acquired also the part owned by Birkhäuser+GBC AG (24%). The sale of VHCA has been discussed by the Executive Committee of our Society for over a year. For the sale, several possibilities were under consideration and discussions were held with more than one publisher. The executive committee decided to proceed after the VHCA incurred losses. In addition, publishing is facing considerable transformations world-wide, also due to the new possibilities of electronic publishing. A Society like ours no longer has the means to successfully accomplish the business or the technical part of publishing.

The journal ***Helvetica Chimica Acta*** will continue and will be published by WILEY-VCH. The Society maintains the right to determine the scientific orientation of the journal through a Committee whose members are selected by our Society.

CHIMIA will not be affected by this sale and remains property of the NSCS. CHIMIA, which is indexed by the *Chemical Abstracts Sercice* and the *Science Citation Index*, continues to enjoy growing popularity with the members of NSCS and its subscribers worldwide. Also, CHIMIA is the official journal of the NSCS and its Sections.

H. Luzius Senti, President

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CHIMIA 52 (1998) Nr. 9 (September)

Invitation to Attend the Fall Meeting of the New Swiss Chemical Society in Zürich, Thursday, October 15, 1998

EDITORIAL

On behalf of the New Swiss Chemical Society (NSCS) and the local Organizing Committee, it is our pleasure to invite you to attend the Fall Meeting 1998 of the NSCS. After the Fall Meeting 1997 which took place in Lausanne, we are particularly delighted that the next one will be held in Zürich, initiating thus a rotation between the two major linguistic regions of our country. Indeed, the next Fall Meetings will be organized in Basel (ILMAC) in 1999, in Lausanne in 2000, and then Basel again (ILMAC, which will become a biennial event) in 2001. As most of you know it, the NSCS had unfortunately to give up the site of Bern for the Fall Meetings, in spite of its central location, as the facilities offered by the University had become too tight. We take this opportunity to thank the University of Berne and the local organizers there for many years of hospitality and service to our meetings.

It is remarkable that the traditionally important meeting of chemists, which constitutes the Fall Meeting, is organized this year jointly by the University of Zürich and the ETH-Zürich. Indeed, even if it takes place in the venues of the latter institution, the organization has been shared by both of them.

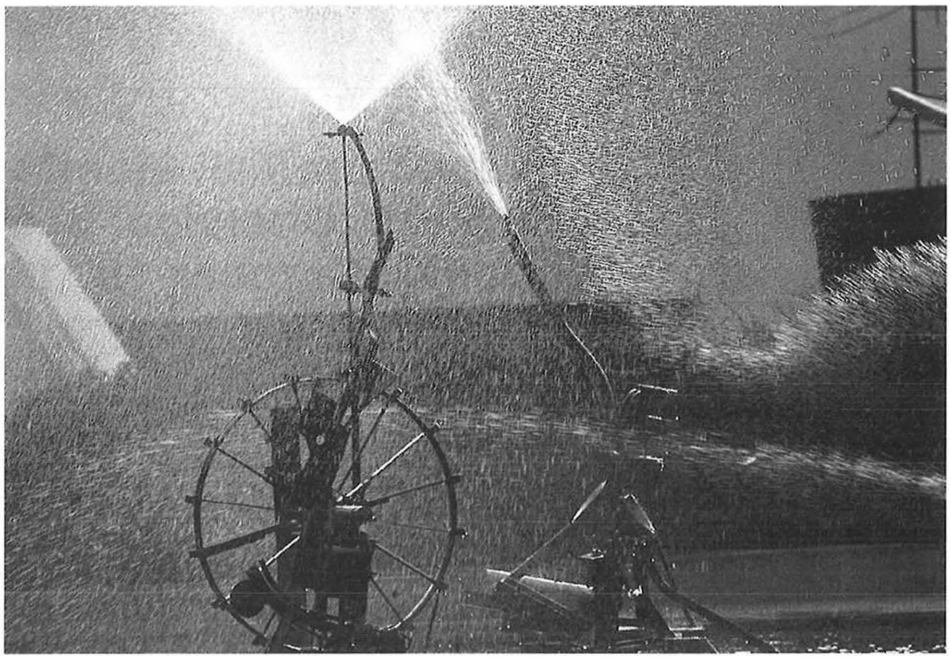
Swiss chemical research participates in the frontiers of science extending to the borders with several other disciplines such as physics, biology, and materials science, and there is no doubt that our country plays a significant role in chemistry as a creative science supporting innovation in several other disciplines and technology, as well. Opportunities such as the Fall Meetings of NSCS are therefore needed to allow different generations of scientists to find stimulation for future projects and to exchange ideas. The following pages of this issue of CHIMIA will convince you that the programme of the 1998 Fall Meeting is reflecting the diversity and outstanding creativity of chemistry in Switzerland. This meeting may therefore be considered as a perfect illustration and presentation of the multifaceted aspects of chemistry, in particular those related to basic and applied research performed at academic institutions and industry.

All the ingredients are there so as to make this 1998 Fall Meeting as successful as the previous ones. We already welcome you in Zürich and hope that you will enjoy the Fall Meeting 1998.

Professor Jacques Weber
Chairman of the Section
Chemical Research of the NSCS

Professor Heinz Berke
Chairman of the local
Organizing Committee

Professor Martin Quack
Cochairman of the local
Organizing Committee



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Herbstversammlung 1998
Assemblée d'automne 1998

Donnerstag 15. Oktober 1998
Jeudi 15 octobre 1998

Zürich

ETH-Zentrum
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Informationen:

Keine Anmeldung erforderlich.

Studierende, die Mitglied der NSCG sind, erhalten folgende Reisekosten zurückerstattet: Bahnbillet nach Zürich, 2. Kl. ½ Tax (Anreise aus dem Ausland: Rückerstattung der Reisekosten ab Schweizer Grenze). Das Bahnbillet ist dem Rückerstattungsantrag beizulegen. Der Rückerstattungsantrag ist unter Angabe der Arbeits- und Privatadresse, des Bank- oder PC-Kontos sowie – womöglich – unter Beilage eines Einzahlungsscheines beim Sekretariat für Weiterbildung und Symposien der NSCG, Frau *Priska Stella-Burgener*, c/o LONZA AG, Sekretariat DCT, Postfach, CH–3930 Visp, einzureichen.

Informations:

L'inscription n'est pas nécessaire.

Les étudiants membres de la NSSC peuvent demander le remboursement des frais de voyage sur la base du billet de train Zürich et retour, 2e classe, ½ tarif (pour les membres qui viennent de l'étranger, seuls les frais de voyage sur territoire suisse sont remboursés). Le billet doit être joint à la demande de remboursement. Veuillez indiquer l'adresse du lieu de travail et privée, le compte bancaire ou postal et joindre, si possible, un bulletin de versement. La demande est à adresser au Secrétariat de la formation continue et des congrès de la NSSC, Mme *Priska Stella-Burgener*, c/o LONZA AG, Sekretariat DCT, Postfach, CH–3930 Visp.

Location:

The Fall Meeting 1998 takes place in the Main Building of ETH-Zürich, Rämistrasse 101, CH–8092 Zürich

Transportation:

It should be mentioned that parking space in the vicinity of the ETH Central Building (ETH-Zentrum) is rather limited. Therefore, it is recommended to travel by train. From the main station of Zürich the ETH Main Building (ETH-Zentrum) can be reached either by tram (6 and 10) or by a few-minutes walk from the station across the river to the cable car Polybahn, which takes you up to the Main Building.

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FR	7.48	9.26	17.34	19.10	FR
GE	6.26	9.26	17.34	20.34	GE
Lausanne	7.02	9.26	17.34	19.58	Lausanne
NE	7.01	8.54	18.06	19.53	NE

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Programm der Herbstversammlung 1998
Programme de l'assemblée d'automne 1998

10.00–10.40 Eröffnung / Cérémonie d'ouverture
Hauptgebäude: Hörsaal F 1
Dr. *H.L. Senti*

Verleihung des *Werner*-Preises 1998
Remise du Prix *Werner* 1998

Vortrag des *Werner*-Preisträgers 1998
Conférence du lauréat du Prix *Werner* 1998
Dr. ***Thomas R. Ward***
Department of Chemistry and Biochemistry, University of Bern
'From Catalyst Design to Molecular Devices – Theory and Experiments'
Abstract: 207, s. Seite 493 / Abstract v. page 493

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Analytische Chemie
Chimie analytique

11.00–11.20 **Mitgliederversammlung**
Assemblée des membres
Hörsaal D 7.1, Hauptgebäude

Vorträge / Conférences: *Hörsaal D 7.1, Hauptgebäude*
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11.20–12.00 ***M. Otto***
Institute of Analytical Chemistry, University of Mining and Technology, Freiberg, Germany
Curriculum in Analytical Chemistry
Abstract 1

12.00–12.30 ***H. Senn**, B. Gsell, A. Ross, G. Schlotterbeck*
Department of Pharmaceutical Research, F. Hoffmann-La Roche Ltd., Basel
Combined Application of LC-NMR and Biomolecular NMR to Analyse Ligand Protein Interactions
Abstract 2

12.30–13.00 ***M. Oehme**, S. Kölliker, U. Berger, S. Brombacher*
Organische Analytische Chemie, Universität Basel
Online Structure Elucidation in the ng Range by HPLC Combined with Multiple Mass Spectrometry (MS^n)
Abstract 3

13.00–14.00 Mittagessen, Déjeuner

14.00–17.00 **Postersession / Session de posters**
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CHIMIA 52 (1998) Nr. 9 (September)

Medizinische Chemie
Chimie thérapeutique

11.00–11.20 **Mitgliederversammlung**
Assemblée des membres
Hörsaal D 1.2, Hauptgebäude

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11.20–11.40 ***P. Acklin***, *R. Lattmann, P. Bühlmayer, A. Crowe, B. Faller, Y. Jin, H.P. Nick, T. Segejew, C. Spanka, A. Wong, P. Zbinden, H.P. Schnebli*
Nervous System, Novartis Pharma AG, Basel
CGP 72670, a Potent, Orally Available Iron Chelator
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11.40–12.00 ***C. Spanka***, *P. Acklin, P. Bühlmayer, A. Crowe, B. Faller, Y. Jin, R. Lattmann, H.P. Nick, T. Sergejew, A. Wong, P. Zbinden, W. Schilling, H.P. Schnebli*
Metabolic and Cardiovascular Diseases, Novartis Pharma AG, Basel
HBED-Half and Prodrug Esters as Orally Active Iron Sequestering Agents
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E. Freund, *C. Bisang, L. Jiang, F. Emery*
Institute of Organic Chemistry, University of Zürich
Synthesis, Conformational Properties, and Immunogenicity of a Cyclic Template-Bound Peptide Mimetic Containing an NPNA Motif from the Circumsporozoite Protein of *P. falciparum*
Abstract 31

L. Jiang, *K. Hofstädter, F. Stuart, J.W. Vrijbloed, J.A. Robinson*
Institute of Organic Chemistry, University of Zürich
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M. Favre, *J. Späth, F. Stuart, L. Jiang, J.A. Robinson*
Institute of Organic Chemistry, University of Zürich
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R. Scheidegger, *P.L. Bounds, W.H. Koppenol*
Laboratorium für Anorganische Chemie, ETH-Zürich
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Abstract 34

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13.00–13.20 ***P. Zillig***, *A. Boiron, B. Giese*
Department of Chemistry, University of Basel
Stereoeffective Radical Cyclization on the Route to Trehazolamine
Abstract 19

13.20–13.40 ***R. Wälchli***, *M. Christen, K. Seuwen, R. Gamse*
Novartis Pharma AG, Basel
Discovery of a New Class of Compounds Strongly Stimulating Cell Proliferation of Osteoblasts *In Vitro*
Abstract 20

13.40–14.00 ***P. Wyss***, *C. Broger, P. Guerry, P. Hartman, C. Hubschwerlen, S. Jolidon, H. Locher, C. Oegner, J.-L. Specklin, H. Stalder*
F. Hoffmann-La Roche AG, Basel
Neue Hemmer der Dihydrofolsäure Reductase
Abstract 21

14.00–14.20 ***M. Missbach***, *E. Altmann, L. Widler, J. Green, M. Susa*
Novartis Pharma AG, Basel
Substituted 5,7-Diphenyl-pyrrolo[2,3D]pyrimidines: Potent and Specific Inhibitors of the Tyrosine Kinase PP60 c-Src
Abstract 22

14.20–14.40 ***C. García-Echeverría***, *P. Furet, M.J.J. Blommers, A. Böttger, V. Böttger, D.P. Lane, P. Chène*
Oncology Research and Core Drug Discovery Technologies, Novartis Pharma AG, Basel
Structural and Molecular Studies on the p53-hdm2 Protein-Protein Interaction
Abstract 23

14.40–15.00 ***P. Traxler***, *G. Bold, E. Buchdunger, J. Frei, M. Lang, H. Mett, P. Furet*
Oncology Research, Novartis Pharma AG, Basel
Strategies toward Identification of Novel and Selective Protein Kinase Inhibitors
Abstract 24

Chairman: *P. Mohr*

15.00–15.20 ***R. Villard***, *G. Delapierre, F. Foriadu, G. Buono*
Laboratoire de Synthèse Asymmétrique ENSSPICAM, Faculté des Sciences de St. Jérôme, 13397 Marseille, France
Modeling Studies and Asymmetric Synthesis of Hydrosoluble Analogues of GalCer, a HIV-1 Cell Receptor
Abstract 25

15.20–15.40 ***K. Zimmermann***, *S. Roggo, C. Betschart, P. Fürst, P. Waldmeier,*
Novartis Pharma AG, Basel
W.G. Tatton
Department of Neurology, The Mount Sinai Medical Center, New York, USA
CGP 3466 and Related Dibenzo[*b,f*]oxepin Derivatives with Neurorescuing Properties and the Synthesis of Tools for Target Identification
Abstract 26

15.40–16.00 ***J. Wichmann***, *M. Bös, H. Stadler, F. Jenck, J.R. Martin, J.-L. Morau , A.J. Sleight*
Pharma Division, Preclinical CNS Research, F. Hoffmann-La Roche AG, Basel
Synthesis of Orally Active 5-HT_{2C} Receptor Antagonists
Abstract 27

16.00–16.20 ***P. Rigollier***, *H. Rüeger, T. Schmidlin, W. Schilling, S. Whitebread, H. Rogg, M. Chiesi, L. Criscione*
Metabolic and Cardiovascular Diseases, Novartis Pharma AG, Basel
Pyrazinoylguanidine Derivatives as Ligands for the Neuropeptide Y Y1 Receptor Subtype
Abstract 28

16.20–16.40 ***R. Wyler***, *B. Büttelmann, T. Godel, M.-P. Heitz, V. Mutel, C. Riemer*
Pharmaceutical Research, Preclinical Neurosciences, F. Hoffmann-La Roche AG, Basel
Triazoloquinazolinediones: A Novel Class of Potent Glycine-Site Directed NMDA and AMPA Receptor Antagonists
Abstract 29

16.40–17.00 ***W.K.-D. Brill***, *A. De Mesmaeker, S. Wendeborn*
Combinatorial Chemistry, Novartis Pharma AG, Basel
Levoglucosan as a Scaffold for Combinatorial Chemistry
Abstract 30

Chemische Forschung
Recherche chimique

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Anorganische Koordinationschemie
Chimie minérale et de coordination

Minisymposium: *Hörsaal E 3, Hauptgebäude*
Chairman: *P. Pregosin*

11.00–11.40 ***S. Decurtins***
Departement Chemie und Biochemie der Universität Bern
Multifunctional Coordination Compounds: Design and Properties

11.45–12.25 ***P. Day***
Royal Institution of Great Britain, London, UK
Organic-Inorganic Hybrid Layer Compounds as Magnets and Superconductors

14.00–14.40 ***K. Wieghardt***
Max-Planck-Institut für Strahlenchemie, Mülheim a.d.R., Deutschland
Radical Cofactors in Biology: from Structural Models to Homogeneous Catalysis

15.00–17.00 **Postersession / Session de posters**
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Organische Chemie / Chimie organique

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Hörsäle E 1.1, E 1.2 und D 1.1: The results described in each poster will be presented by the main author; 2 slides / 3 min. max. each presentation.

Hörsaal E 1.1: Chairman: *J.A. Robinson*, Universität Zürich
H. Trafelet, E. Moyroud, O. Botta, S. Gunzenhauser, H.W. Schmitt, N. Jourdain, G. Klein, A. Blaser, C. Schenkels, K. Kloiber, C. Jarret, M. Poncioni, Y. Abel/F.-P. Montforts, R. Buff, N. Bensel
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Hörsaal E 1.2: Chairman: *P. Müller*, Université de Genève
M. Mayor, Z. Teng, M. T. Damiano, P. Müller, M. Schneider, F. Keller, V.S. Ranade, S. Tohill, C.A. Müller, K. Borszeky, M. Dusi, A. Fischer, N. Künzle, R.R. French
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Hörsaal D 1.1: Chairman: *S. Bienz*, Universität Zürich
E. Lacôte, T.P. Sieber, J.-M. Simone, A. Forster, L. Quaranta, L. Ducry, C. Imboden, L. Andrau, F. Villar, K.P. Kaliappan, C. Botuha, R. Cannas, E. Couché, J.A. Martinez-Pérez
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Chairman: *T. Carell*

14.00–14.20 ***U. Diederichsen,*** *D. Weicherding, E. Vockelmann*
Org. Chemie & Biochemie TU München, Garching, Deutschland
Aminosäureseitenketten-Nucleobasen-Erkennung in Alanyl-PNA
Abstract 103

14.20–14.40 *X. Wu,* ***S. Pitsch***
Laboratorium für Organische Chemie, ETH-Zürich
An Efficient Synthesis of Functionalized Oligoribonucleotides
Abstract 104

14.40–15.00 *E. Biala*, ***P. Strazewski***
Institute of Organic Chemistry, University of Basel
Thermodynamics of $tRNA^{Ala}$ Acceptor Stem Microhairpin Variants
Abstract 105

15.00–15.20 ***J. Hunziker***
Department of Chemistry, University of Bern
Aminoglycoside-Modified Oligodeoxynucleotides: Synthesis and Pairing Properties
Abstract 106

15.20–15.40 ***J. Butenandt***, *L. Burgdorf, T. Carell*
Laboratorium für Organische Chemie, ETH-Zürich
Synthesis and Enzymatic Investigation of Oligonucleotides Containing an Isosteric DNA-Photolesion Analogue
Abstract 107

15.40–16.00 ***R. Steffens***, *C. Leumann*
Departement für Chemie und Biochemie der Universität Bern
Tricyclo-DNA: Synthesis and Properties of a Nucleic-Acid Analog with a Tricyclic Sugar Moiety
Abstract 108

16.00–16.20 ***M. Tollinger***, *R. Konrat, B.H. Hilbert, E.N.G. Marsh, B. Kräutler*
Institute of Organic Chemistry, University of Innsbruck, Austria / Department of Chemistry, University of Michigan, Ann Arbor, MI, USA
How a Protein Prepares for B_{12}-Binding: Structure and Dynamics of the B_{12}-Binding Subunit of Glutamate Mutase from *Clostridium tetanomorphum*
Abstract 109

Vorträge / Conférences: *Hörsaal E 1.2, Hauptgebäude*
Abstracts: 110–116, s. Seite 469 / v. page 469
Chairman: *P. Rüedi*

14.00–14.20 ***T. Wirth***, *U.H. Hirt*
Institut für Organische Chemie der Universität Basel
Stereoselective Reactions with Chiral Hypervalent Iodine Compounds
Abstract 110

14.20–14.40 ***G. Fragale***, *M. Spichty, T. Wirth*
Institut für Organische Chemie der Universität Basel
Mechanism of the Stereoselective Alkoxyselenenylation Reaction
Abstract 111

14.40–15.00 ***A. Studer***, *M. Bossart, H. Steen*
Laboratorium für Organische Chemie, ETH-Zürich
S_Hi Reaction at Silicon – Some Rate Constants and Stereoselective Cyclizations
Abstract 112

15.00–15.20 ***C. Ollivier***, *P. Renaud*
Institut de Chimie Organique, Université de Fribourg
B-Alkylcatecholboranes as Source of Radicals
Abstract 113

15.20–15.40 *G. Bernardinelli, M. Bruin, E.P. Kündig, M.J. Mayor-Lopez*, ***C. Saudan***, *E. Thiemermann, J. Weber*
Départements de Chimie Organique et Chimie Physique, Université de Genève
New Iron and Ruthenium Lewis Acids for the Asymmetric Catalysis of the Diels-Alder Reaction
Abstract 114

15.40–16.00 ***V. Huber***, *S. Lauper, T.P. Sieber, M. Alves, T.A. Jenny*
Institute of Organic Chemistry, University of Fribourg
Sakurai or Ene Reaction?
Abstract 115

16.00–16.20 ***R.M. Stoop***, *A. Mezzetti*
Laboratorium für Anorganische Chemie, ETH-Zürich
The Asymmetric Epoxidation of Olefins with H_2O_2 Catalyzed by a Five-Coordinated Ruthenium(II) Complex
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Chairman: *D. Hilvert*

14.00–14.20 *G. Baisch*, ***R. Öhrlein***
Novartis Pharma AG, Basel
Use of Glycosyl-Transferases for the Synthesis of Non-Natural Oligosaccharides
Abstract 117

14.20–14.40 ***P. Janser***
Novartis Pharma AG, Basel
Stereoselective Synthesis of 4-Fluoro-Bmt, a Fluorinated Analogue of the Unusual Amino Acid Found in Cyclosporin
Abstract 118

14.40–15.00 *P. Barbier, P. Mohr, M. Muller*, ***R. Masciadri***
F. Hoffmann-La Roche Ltd., Pharma Research Preclinical, Infectious Diseases, Basel
Tetrabutylammonium Dihydrogen Trifluoride in 1-α-Fluoro-25-Hydroxy-Vitamin D_3 Chemistry
Abstract 119

15.00–15.20 ***H. Aissaoui***, *R. Bachmann, A. Schweiger, W.-D. Woggon*
Institut für Organische Chemie der Universität Basel / Laboratorium für Physikalische Chemie, ETH-Zürich
The Origin of the Low Spin Character of the Resting State of $P450_{cam}$ – Conclusions from Experiments with Enzyme Models
Abstract 120

15.20–15.40 ***R. Mah***, *H. Rüeger, J. Zergenyi*
Novartis Pharma AG, Metabolic and Cardiovascular Diseases, Basel
Novel Synthesis of a Tetracyclic Amine Template
Abstract 121

15.40–16.00 ***R. Müller***, *P. Rüedi*
Organisch-chemisches Institut, Universität Zürich
Unerwartete Transformationen an tetracyclischen Diterpenen
Abstract 122

16.00–16.20 ***P. Wettstein***, *C. Stähelin, B. Giese*
Department of Chemistry, University of Basel
Memory Effect of Chirality – Photocyclization of Amino Acids *via* Biradicals
Abstract 123

Physikalische Chemie / Chimie physique

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Chairman: *S. Leutwyler*

11.00–11.20 ***P. Novák***, *F. Joho, R. Imhof, J.-C. Panitz, O. Haas*
Paul Scherrer Institute, Electrochemistry, Villigen PSI
Interactions between Graphite and Carbonate-Based Electrolytes
Abstract 167

11.20–11.40 ***R. Seifert***, *A. Kunzmann, G. Calzaferri*
Departement für Chemie und Biochemie, Universität Bern
The Cause of the Yellow Colour of Activated Silver-Containing Zeolite A
Abstract 168

11.40–12.00 ***M. Schildenberger***, *Y. Bonetti, M. Aeschlimann, R. Prins*
Laboratory for Technical Chemistry, ETH-Zürich
Nanostructured Model Catalyst Systems and their Use in the Field of Heterogeneous Catalysis Research
Abstract 169

12.00–12.20 ***S.H. Bossmann***, *A. Braun*
Lehrstuhl für Umweltmesstechnick am Engler-Bunte-Institut der Universität Karlsruhe, Deutschland
Hydrophobic Interactions of Metal-Polypyridyl-Complexes at the Surfaces of Starburst Dendrimers
Abstract 170

12.30–14.00 **Lunch / Posters**

Chairman: *T. Rizzo*

14.00–14.20 ***B. Fehrensen***, *D. Luckhaus, M. Quack*
Laboratorium für Physikalische Chemie, ETH-Zürich
The Adiabatic Reaction Path Hamiltonian Approach Applied to Inversion Tunneling Spectra of Aniline and Hydrogen Bond Clusters
Abstract 171

14.20–14.40 ***F. Talbot***, *S. Leutwyler*
Departement für Chemie and Biochemie, Universität Bern
Intermolecular Bonding and Vibrations of 2-Naphthol·$(H_2O)_2$
Abstract 172

14.40–15.00 ***A. Inauen***, *S. Leutwyler*
Departement für Chemie and Biochemie, Universität Bern
Intermolecular Vibrations in Chiral Pair Complexes
Abstract 173

15.00–15.20 ***J. Pochert***, *M. Quack, M. Willeke*
Laboratorium für Physikalische Chemie, ETH-Zürich
Infrarotspektroskopie und Femtosekundendynamik von Tetrafluoridoethan (CF_3CHFI)
Abstract 174

15.30–17.00 **Postersession / Session de posters**
Haupthalle Hauptgebäude
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Computerunterstützte Chemie
Chimie computationnelle

11.00–12.00 **Postersession / Session de posters**
Haupthalle Hauptgebäude
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Vorträge / Conférences: *Hörsaal D 5.2, Hauptgebäude*
Abstracts: 195–199, s. Seite 490 / v. page 490
Chairman: *J. Weber*

14.00–14.20 ***M. Buchs***, *C.W. Schläpfer, C. Daul*
Institut de Chimie Inorganique et Analytique, Université de Fribourg
Study of Bis(2,2,6,6-tetramethylheptane-3,5-dionato)nickel(II) and the Addition Product with Bipyridine Using DFT
Abstract 195

14.20–14.40 ***I. Ciofini***, *C. Daul, V. Barone, A. Bencini*
Institut de Chimie Inorganique et Analytique, Université de Fribourg
Magneto-Structural Analysis of Exchange Interaction in the Biverdazyl Diradical
Abstract 196

14.40–15.00 ***J.L. Barras***, *C. Daul, E. Deiss*
Institut de Chimie Inorganique et Analytique, Université de Fribourg
First Principles Modelling of Lithium Intercalation into Graphite and Manganese Oxide for Electrodes: Where is the 'bottle neck'?
Abstract 197

15.00–15.20 ***N. Vulliermet***, *T.A. Wesolowski, J. Weber*
Département de Chimie Physique, Université de Genève
A KSCED-DFT Study of the Physisorption of CO on the MgO(100) and ZnO($10\bar{1}0$) Surfaces
Abstract 198

15.20–15.40 ***H.M. Senn***[a]), *P.E. Blöchl*[b]), *A. Togni*[a])
[a]) *Laboratory of Inorganic Chemistry, ETH-Zürich*
[b]) *IBM Research Division, Zürich Research Laboratory, Rüschlikon*
In Search of New Hydroamination Catalysts: Static and Dynamic *Ab Initio* DFT Studies
Abstract 199

Analytical Chemistry **1**

Curriculum in Analytical Chemistry

Matthias Otto

University of Mining and Technology, Institute of Analytical Chemistry, Leipziger Str. 29, D-09599 Freiberg, Germany

In these days of globalisation of trade and commerce and of booming world markets for analytical equipment to control this development, education in Analytical Chemistry has become a subject of high priority. A harmonized curriculum in Analytical Chemistry should combine both strict recommendations for the basic part of the analytical studies - to provide for a common language as needed in modern teamwork and industrial problem solving worldwide - and freedom of choice of selected topics in the advanced and post-graduate parts [1].
Today education in Analytical Chemistry requires more than teaching separate courses on its fundamentals and on instrumental analysis. The basics of chemical equilibria and high performance analytical methods should rather be taught as a unit. Topics such as sampling, chemical and biosensors, chemometrics and quality assurance/control, hyphenation and miniaturization as well as process analytical chemistry are becoming vital for the analyst of the future and are to be taught as advanced subjects.

A new international textbook "Analytical Chemistry" edited by R. Kellner, J.-M. Mermet, M. Otto and the late H. M. Widmer from Basel, and published by Wiley-VCH [2] might serve as the basis for a modern approach in Analytical Chemistry. Details of this approach will be discussed in my contribution.

[1] R. Kellner, Anal. Chem. **66** (1994), 98A-101A.
[2] R. Kellner, J.-M. Mermet, M. Otto, H. M. Widmer (Eds.), Analytical Chemistry, Wiley-VCH, 1998.

Analytical Chemistry **2**

Combined Application of LC-NMR and Biomolecular NMR to analyse Ligand Protein Interactions

H. Senn, B.Gsell, A. Ross and G. Schlotterbeck,

Department of Pharmaceutical Research, F. Hoffmann-La Roche Ltd.

CH-4002 Basel

HPLC-NMR coupling is a relatively new technique in mixture analysis which combines the separation efficiency of HPLC with the structural specificity of NMR spectroscopy. This method can be used to separate a compound of interest from a mixture to obtain its pure NMR spectrum in one step. The direct coupling of HPLC and NMR has therefore become a more and more established hyphenated technique and is used for a great variety of applications in pharmaceutical analysis and combinatorial chemistry. This is of great importance because in most kinds of chemical synthesis (classical and combinatorial) the analytes occur in crude mixtures or in pharmacological investigations of body fluids metabolites are present in a matrix. The structural identification of the individual components present in such a complex mixture requires either the often time consuming and tedious off-line use of an efficient separation system in order to isolate the analytes in a relatively pure state followed by spectroscopy for structure elucidation or the use of on-line coupled techniques.

Biomolecular NMR has developed over the last decade a battery of new techniques and methodologies to study e.g. protein structures (drug targets) and their interactions with ligand (drug) molecules. A very recent development in this field (SAR by NMR) allows the fast identification of selectively binding molecules to a localised site on the protein. This technique can be used for screening chemical libraries or natural products.

Here, we present a combined application of SAR by NMR and LC-NMR for studies of protein-ligand interactions. Protein-ligand complexes were separated under denaturing conditions by RP-HPLC and the active binding structure of the ligand was determined by on-line coupled NMR spectroscopy. Possible alterations in the covalent ligand structure caused by the protein could thus be detected.

Analytical Chemistry **3**

On line structure elucidation in the ng range by HPLC combined with multiple mass spectrometry (MS^n)

Michael Oehme, Stephan Kölliker, Urs Berger and Stephan Brombacher

Organische Analytische Chemie, Universität Basel, Neuhaustr. 31 4057 Basel

Recently, our group introduced ion trap multiple fragmentation mass spectrometry (MS^n) combined with HPLC for structure elucidation and identification of trace compounds in complex samples. Major aims are the development of fragmentation schemes which allow to elucidate the structure of polar compounds of environmental concern in real samples and to apply this technique for quantification in the pg to ng range. A survey is given about the results obtained so far using on the following examples: Identification of 2,4-dinitrophenylhydrazone derivatives of $>C_5$ carbonyl compounds in ambient air samples [1], structure elucidation of unknown aconitum alkaloids in plant extracts, and identification and quantification of trichothecene toxins in cereals.

Due to the strongly increased sensitivity, contaminants originating from mobile and stationary phases or construction materials may cause considerable problems. Examples will be shown. Atmospheric pressure chemical ionization in the positive or negative ion mode was the most suitable detection method for quantification. Linearity over 3 orders of magnitude could be obtained. Fragmentation paths obtained by MS^3 to MS^4 were studied in detail using isotope-labeled reference compounds. They allowed to establish a fragmentation scheme which enabled both a structure confirmation and elucidation of higher isomeric carbonyl in the atmosphere with 1-10 ng. A similar but simpler approach was established for the identification of aconitum alkaloids.

[1] S. Kölliker and M. Oehme, Anal. Chem., in press 1998.

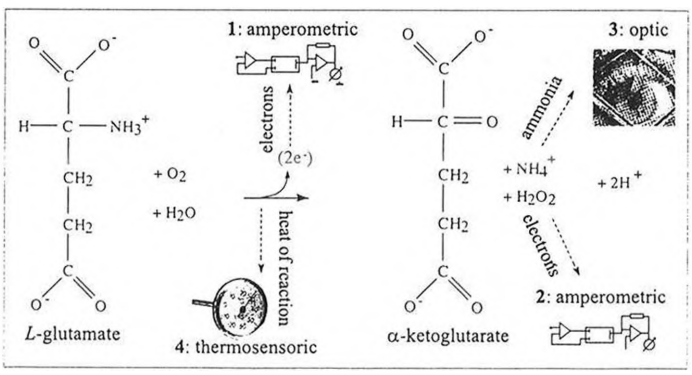
Analytische Chemie **4**

Development of an enzyme based *L*-glutamate biosensor

S. Nagel, J. P. Müller and U. E. Spichiger-Keller

Center for Chemical Sensors, Department of Pharmacy, ETH Zurich

Various biosensors have been developed that determine *L*-glutamate concentrations in solution. Amperometric (**1**,**2**), optic (**3**) or thermocoupled methods (**4**) can be found in the literature. The most commonly applied enzyme for these sensors is *L*-glutamate oxidase because of its high specificity and stability.
Whereas indirect amperometric methods based on H_2O_2 production (**2**) often cause strong interferences, the direct mediated transfer of the electrons from the glutamate oxidase to the electrode (**1**) is strongly affected by dissolved oxygen. The main reason for the oxygen interference is the location of the active site, which seems not to be accessible for the mediator.
This work focuses on the modification of the *L*-glutamate oxidase based on structural modeling by computers and on changing the electron transfer catalysts. The goal is to produce a tailor-made enzyme by site-directed mutagenesis suitable for our sensors.



Analytical Chemistry **5**

LC/MS^n: Analysis of saponins in crude plant extracts

Camille Perret, Jean-Luc Wolfender and Kurt Hostettmann

Institut de Pharmacognosie et Phytochimie, Université de Lausanne, BEP, CH-1015 Lausanne

Saponins are high molecular weight glycosides consisting of a sugar moiety linked to a triterpene aglycone. These widespread compounds have detergent and haemolytic properties [1].

Numerous saponins have already been described from different plant sources and thus an efficient dereplication of crude plant extracts represents an important step for the targeted isolation of new saponins. A LC/MS method involving electrospray (ES) ionisation of these components together with further up-front CID (collision induced dissociation), MS/MS and MS^n fragmentation has been developed for their rapid on-line characterisation.

Sensitive detection of saponins was obtained in ES (negative mode) by addition of alkaline buffer post-column, generating intense deprotonated molecular ions. Sugar sequence information as well as aglycone molecular ions were obtained by further MS/MS experiments. Up-front CID-MS provided some structural information. MS/MS multiple stage experiments (MS^n) on an ion trap (IT-MS) allowed a selective fragmentation of the molecular ion and subsequently of each specific fragment. This permitted a precise on-line assignment of the sugar sequence and aglycone ion of each saponin within a crude extract, generating important structural information.

This method has been applied for the screening of methanolic and aqueous extracts of *Phytolacca dodecandra* (Phytoloccaceae) berries. The constituents of this plant are mainly bidesmosidic saponins in the methanolic extract and monodesmosidic saponins in the aqueous extract. The LC/MS method described here provides a rapid estimation of the saponin composition of these extracts.

[1] K. Hostettmann, A. Marston, "Saponins", Cambridge University Press, Cambridge, 1995.

Analytical Chemistry **6**

Rapid detection of the active compounds of *Orophea enneandra* (Annonaceae) by LC/UV/MS and LC/NMR

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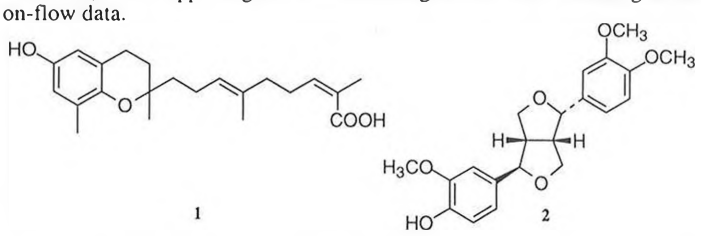
In our search for new antioxidants in higher plants, the dichloromethane extract of the leaves from *Orophea enneandra* Bl. (Annonaceae) displayed antioxidant, radical scavenging and antifungal properties in autographic TLC assays. For the determination of the compounds responsible for the antioxidant activity, fractions were directly collected from an analytical HPLC separation and were submitted to autographic assays [1]. LC/UV peaks **1** and **2** were thus assigned with precision as the antioxidant compounds. In order to obtain rapid preliminary structure information on these active constituents, a chemical screening was performed on the antioxidant fraction by LC/UV/MS and LC/NMR [2], providing important spectroscopic data for these two constituents. This LC on-line information enabled the most probable identification of **1** and **2** as polycerasoidol and phylligenin, respectively. In order to quantify the antioxidant properties of these compounds in a dilution assay, their targetted isolation was undertaken. Compounds **1** and **2** were confirmed as polycerasoidol and (-)-phylligenin, respectively, from their spectroscopic data (UV, EI and D/CI MS, ^{1}H- and ^{13}C-NMR), thus supporting the structural assignments made according to the on-flow data.



[1] M. Cuendet, K. Hostettmann, O. Potterat, W. Dyatmiko, *Helv. Chim. Acta* **1997**, *80*, 1144-1152.
[2] E. Garo, J-L. Wolfender, K. Hostettmann, W. Hiller, S. Antus, S. Mavi, *Helv. Chim. Acta* **1998**, *80*, 754-763.

Analytical Chemistry **7**

Spectroscopic Analysis Beyond the Diffraction Limit: Methodologies and Applications

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Since the invention of the Scanning Near-Field Optical Microscope (SNOM) spectroscopic analysis became possible with sub-micrometer spatial resolution. Non-destructive investigations can be carried out at ambient conditions by means of Raman or fluorescence spectroscopy with potential applications in fields ranging from material science to cell biology [1].

Using this novel technique, a spatial resolution below 100nm can now routinely be achieved. For example, Raman spectra of only a few hundred Rhodamine 6G dye molecules could be obtained simultaneously with a topographical image giving insight into field enhancement effects on roughened silver surfaces [2,3].

However, it is crucial for certain applications to improve the spatial resolution by another order of magnitude. As higher laser powers would destroy the scanning probes used, smaller spot sizes consequently lead to longer measuring times required. New approaches, such as FOcussing LAser radiation in the Near-field of a Tip (FOLANT) or Surface Enhanced Raman Spectroscopy (SERS) are possible strategies to overcome this problem.

[1] A. Lewis, K. Liebermann, *Anal. Chem.* 1991, **63**, 625A-638A
[2] D. Zeisel, V. Deckert, R. Zenobi, T. Vo-Dinh, *Chem. Phys. Lett.* 1998, **283**, 381-385
[3] V. Deckert, D. Zeisel, R. Zenobi, T. Vo-Dinh, *Anal. Chem.* in Press, to appear in June 1998

Analytische Chemie **8**

Analytical investigations on a CO_2 extract from kava rootstocks

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Institute for Technical Chemistry[1], University of Erlangen-Nürnberg/G

Kava (*Piper methysticum* G. Forst., Rauschpfeffer), a member of the pepper family Piperaceae, is a plant from the Pacific Islands with an outstanding psychoactivity. In modern phytotherapy standardized kava extracts are used against nervous anxiety, states of tension and restlessness.

By way of fractionated CO_2-supercritical fluid extraction, it was possible to obtain the six main active compounds (Fig. 1) with an extraction yield better than 85% (w/w; HPLC). To reduce the flavokavain content below 0.2% an in-line adsorption step on Al_2O_3 was added.

To even better understand the chemical composition of the still complex extract, gas chromatography/mass spectrometry (GC/MS) investigations were undertaken and compared to the results obtained by high performance liquid chromatography (HPLC) under reversed phase (RP) and normal phase (NP) conditions. Furthermore, HPLC/electrospray ionization (ESI)/MS experiments helped to identificate the minor kava compounds.

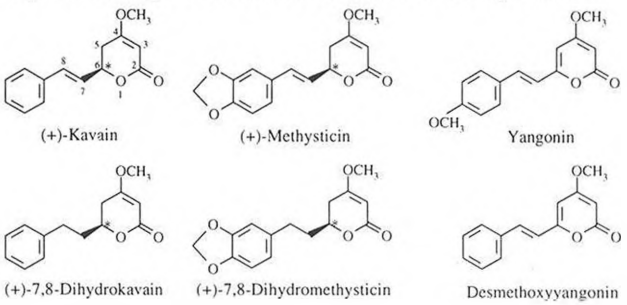

Fig. 1 The six major kavalactones of a *Piper methysticum* extract

Analytische Chemie **9**

Rapid Determination of Pesticides in Milk by GC

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Fast pesticide analysis of samples with high fat content can only be achieved when laborious cleanup steps are bypassed [1, 2, 3]. Traditionally the sample treatment involves several extractions and cleanup steps (e.g. Florisil, gel-permeation chromatography) to eliminate fats which interfere in the chromatographic separation.
K. Grob already could analyse edible oils and fats without cleanup using a gc-injector equipped with a special liner developed by G. Morchio [4, 5]. We now report a method in which residual fat in the extract does not interfere in chromatography when using the aformentioned liner. I is possible to analyse polar and apolar pesticides in milk following a single extraction procedure. The method was validated for several classes of pesticides.

Spiked Compounds	Recovery (%)	Detection	LOD (µg/kg fat)
organochlorine pesticides	68 - 112	ECD	30
polychlorinated biphenyls	71 - 95	ECD	3
phosphorous acid esters	81 - 121	FPD	1
nitromusk compounds	83 - 107	ECD	10

Our method shows following advantages:
- Sample preparation is shortened to about the half.
- Determination of polar and nonpolar compounds in a single analysis.
- Higher sensitivity.
- Lower analysis costs (e.g. no gel-permeation chromatography).

[1] Pesticide Analytical Manual (PAM), FDA, Washington, **Chp. 210** (rev. 1978).
[2] Official Methods of Analysis of the AOAC, Washington, **Chp.29** (1975).
[3] Rückstandsanalytik von Pflanzenschutzmitteln, DFG, Weinheim, **S 10** (1991).
[4] Morchio G (1982) Riv. Ital. Sostanze Grasse **59**: 335.
[5] Grob K., M.Biedermann and A.M. Giuffre: Z Lebensm Unters Forsch (1994) **198**: 325.

Analytical Chemistry **10**

Assessment on the Applicability of Two-Step Laser Mass Spectrometry for the Analysis of Pesticides

Thomas D. Bucheli, Olivier P. Haefliger, and Renato Zenobi

Department of Chemistry, Swiss Federal Institute of Technology (ETH), Universitätstrasse 16, 8092 Zürich, Switzerland.

Two-step laser mass spectrometry (L2MS [1]) offers unique advantages such as the redundancy of sample preparation and very low detection limits. We attempt to make use of these specific benefits in applying L2MS to the field of environmental analytical chemistry.

After desorption of the analytes with an IR laser pulse, resonance enhanced two-photon ionization (1+1 REMPI) is performed with a tunable UV laser. The efficiency of this ionization mechanism greatly varies from analyte to analyte, and is of crucial influence on the limit of detection (LOD). Whereas the photoionization ion yield has been investigated in detail for PAHs, it remains uncharacterized for most other environmental pollutants. Therefore, we currently determine ionization efficiencies of various pesticides relative to Benz(a)anthracene (BaA), a well characterized analyte with a LOD in the low attomole range. Initial results indicate that for a set of naphthyl-pesticides, namely Carbaryl, Naphthyl Acetic Acid, and Naphthyl Acetamide, ion yields are about one order of magnitude lower than for BaA. Aromatic carbamates (e.g., Carbofuran, Propoxur, or Propham), and other aromatic pesticides such as, e.g., Warfarin, and Isoproturon, exhibit relative ionization efficiencies of around 1%. Still other pesticides are hardly ionizable with nanosecond laser photoionization in the mid UV (e.g., Atrazine, Metamitron, and Metsulfuron methyl). Conclusively, the determination of relative ionization effeciencies is a straightforward tool to judge the feasibility of L2MS for the analysis of individual environmental pollutants. Clearly, L2MS has the potential for the trace analysis of PAHs and pesticides with similar ion yields in various kind of environmental samples.

The data obtained is useful for the application of L2MS to the analysis of aqueous water samples in combination with modified Solid Phase Micro Extraction (SPME), Solid Phase Extraction (SPE) using extraction disks, or by direct analysis of frozen water samples, as currently pursued in our laboratory.

[1] Voumard, P., Zhan, Q., and Zenobi, R. 1993. Rev. Sci. Instr. 64 (8), 2215-2220.

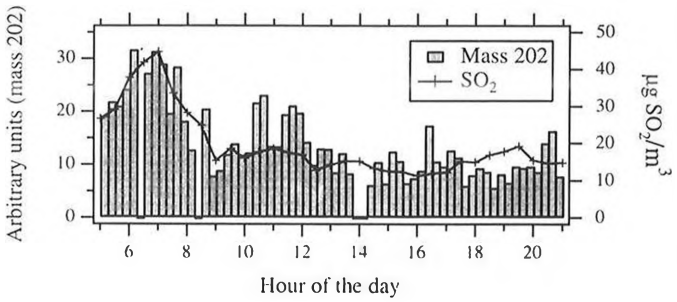
Analytical Chemistry **11**

TIME-RESOLVED ANALYSIS OF PARTICLE-BOUND AROMATIC COMPOUNDS IN URBAN AIR USING TWO-STEP LASER MASS SPECTROMETRY

Olivier P. Haefliger, Thomas D. Bucheli, and Renato Zenobi

Department of Chemistry, Swiss Federal Institute of Technology (ETH), Universitätstrasse 16, 8092 Zürich, Switzerland.

Two-step laser mass spectrometry (L2MS) is used for the direct analysis of selected compounds in complex mixtures such as environmental samples. Two lasers are used to perform desorption and soft ionization followed by time-of-flight mass analysis in a mass spectrometer. The mass spectra are dominated by intact parent ions of the analytes. Major advantages are the detection limit in the attomole range and minimal or no need for sample preparation.We report here on the application of L2MS to the time-resolved analysis of polycyclic aromatic compounds (PACs) adsorbed on urban aerosol particles. 1 cm^2 pieces of quartz fiber filter mounted on specifically designed filter holders were used for both sampling (20 L/min) and measurement in our L2MS instrument immediately thereafter. Temporal variations were recorded with a time resolution of 15 minutes. The figure below shows for example the development of the ion signal at mass 202 (pyrene, $C_{16}H_{10}$, and isomers) recorded downtown Zürich on February 3rd, 1998. The similarity with the curve measured for SO_2, which is known to be generated by local heating, may suggest that this is also an important source of PACs.



Analytical Chemistry **12**

The Gas-phase Basicities of MALDI-matrix anions

K. Breuker, R. Knochenmuss, R. Zenobi

Institute of Organic Chemistry, ETHZ, Zürich, Switzerland

The gas-phase basicities of deprotonated MALDI-matrix anions were determined using the bracketing method in a 4.7 Tesla Fourier-Transform ion cyclotron resonance (FT-ICR) mass spectrometer (MALDI = matrix-assisted laser desorption/ ionization). The intention of this work was to determine fundamental thermochemical MALDI-matrix properties which are relevant for the ionization process in MALDI. Although MALDI has become a widespread ionization technique during the last decade, neither matrix nor analyte ionization is fully understood yet.

In conventional bracketing experiments, reference ions are produced by electron impact of a volatile gas which is submitted through a pulsed valve. This method has two substantial disadvantages: first, the high pressure pulse is detrimental to FT-ICR operating conditions, and second, the hot electron filament produces a temperature gradient along the cell volume resulting in temperature uncertainties. We developed a new technique for reagent ion generation that circumvents external gas introduction and the need of an electron gun [1]. The new technique involves laser desorption of preformed reagent ions which are deposited in a binary liquid/solid mixed matrix. Upon laser desorption, reagent ions are liberated and subsequently trapped in the ion cell where they are available for gas-phase reactions.

[1] K. Breuker, R. Knochenmuss, R. Zenobi, accepted for publication in Int. J. Mass Spectrom.

Analytical Chemistry **13**

Spectroscopic properties of jet-cooled MALDI Matrices and clusters

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Institute of Organic Chemistry, ETHZ Zürich, Switzerland

The ionisation mechanisms of matrix assisted laser desorption/ionization (MALDI) mass spectrometry are not well understood, nor are the molecular characteristics that make a good matrix. We are using molecular beam techniques and laser spectroscopy to determine the MALDI-relevant characteristics of matrices.

Photoionized radical matrix cations have been proposed as the primary MALDI ions. For 2,5 dihydroxybenzoic acid (DHB) we found an ionization energy of 8.04 eV. Direct two photon ionization with a nitrogen laser (7.64 eV) can then be ruled out as an ionization mechanism.

With measured DHB properties, we modelled a two-center pooling mechanism for ion formation, which can lead to significant ion yield. Further studies of dimers and higher clusters will help refine the model. Among the most important questions is the degree of IP lowering in clusters and the bulk. Is there a cluster size which can be directly ionized by a nitrogen laser?

Excited state proton transfer (ESPT) reactions have been proposed as analyte protonation mechanisms. Fluorescence spectra of 2,5 DHB show no evidence for labile protons. ESPT behavior of other matrices and matrix clusters is under study. An inter-molecular proton transfer reaction has been observed for ionized nicotinic acid clusters.

Reactive matrix fragments are also under study. We have found that thermal decarboxylation of matrices is common, and in some cases we have identified these products in a MALDI plume. Decarboxylated DHB (hydroquinone) has also been shown to donate a proton to triethylamine in the molecular beam, which shows that this reaction pathway is feasible.

Analytical Chemistry **14**

A quantitative comparison between an ion-to-photon detector and a microchannel plate used in time-of-flight mass spectrometry

F. Dubois[1], A. Brunelle[2], C. Deprun[2], R. Knochenmuss[1], R. Zenobi[1] and Y. Le Beyec[2]

1: Institute of Organic Chemistry, ETHZ, Zürich, Switzerland
2: Institute of Nuclear Physics, University Paris-Sud, France

In this contribution, an alternative way of ion detection [1] for time-of-flight mass spectrometry was quantitatively compared to a conventional detector using single event techniques and current measurements. Instead of amplifying secondary electrons created by the ion impact onto a surface, photons that are simultaneously created were detected with a photomultiplier. The efficiency of this ion-to-photon detector (IPD) was enhanced when using specially coated conversion surfaces such as scintillators.

Single ions were produced with plasma desorption: natural fission fragments of a ^{252}Cf source induce sample ionization and desorption. A range of samples with various molecular weights were alternatively measured with the IPD and a microchannel plate (MCP) for comparison. The relative intensities IPD/MCP was found to decrease as the molecular weight increases for a constant ion energy.

Experiments were also done using current measurements, ions were produced with Matrix assisted Laser Desorption/Ionization (MALDI). In that case, the intensities were not only dependent on the mass of the sample but also on the number of ions contained in the ion package.

[1] F.Dubois, R.Knochenmuss, R. Zenobi, *Int. J. Mass Spectrom. Ion Processes* **169/170**, 89 (1997).

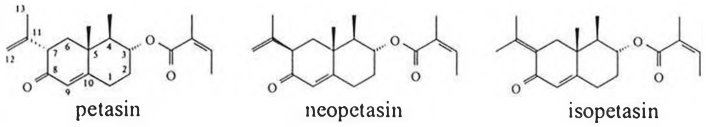
Analytical Chemistry **15**

Impact of New Stationary Phases on Natural Product Analysis

S. Jordi, S. Oppliger, M. Neuenschwander*, B. Debrunner[1] and B. Meier[1]

Department of Chemistry, University of Berne*, CH-3012 Berne and Max Zeller Söhne AG[1], CH-8590 Romanshorn

Exemplified on plant extracts from *Petasites hybridus* (butterbur, Pestwurz) the two C(7)-epimers petasin and neopetasin and their corresponding isomer isopetasin were separated by a simple and reproducible RP-HPLC and PDA detection. The complex drug mixture resulted from liquid extraction with CO_2 or from extraction with apolar or medium polar organic solvents (like ethers, dichloromethane, etc.).



petasin neopetasin isopetasin

New commercially available modified RP materials with reduced silanol interactions (bonded phases including YMC 3µm ODS-AM; J'Sphere H80 and L80; Octyl; Megapharm C_{18}; C_{30}; KOVASIL 1.5µm nps C_{14}) were tested and showed distinct differences in the selectivity. Comparing the astonishing HPLC-profiles the best separation was chosen for complete method validation according to the FIP guidelines. The aim of the validation was to establish a simple and reproducible method for use in quality control, for dissolution and stability tests or for checking the bioavailability of these compounds in plasma samples.

Extracts from *P. hybridus* are of considerable phytopharmaceutical interest, because of their promising, anti-allergic properties.

Analytical chemistry **16**

Identification of natural bioactive compounds in vegetal material from infected plants by LC-MS^n

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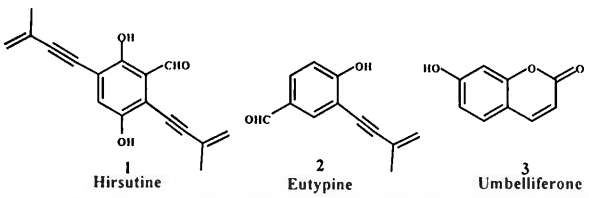
Institut de chimie, Université de Neuchâtel
Avenue de Bellevaux 51, CH-2000 Neuchâtel

Studying cryptogamic diseases as eutypiosis, ESCA, or plane tree's stain canker, we isolated some toxic compounds from the fungi culture media.

ESCA and eutypiosis are responsible for the withering of vine, causing its death. Hirsutine (**1**) has been isolated from *Stereum hirsutum*, one of the fungi involved in ESCA[1]. Eutypine (**2**) was extracted from *Eutypa lata*[2], fungus responsible for eutypiosis. *Platanus*' stain canker is induced by *Ceratocystis fimbriata* that also produces phytotoxic metabolites. In presence of the pathogenic fungus, *Platanus acerifolia* produces umbelliferone (**3**) as a defense compound (phytoalexin)[3].



1 Hirsutine **2** Eutypine **3** Umbelliferone

In order to confirm the presence of the phytotoxins or the phytoalexin in the infected vegetal material, we analyzed the rising sap and the wood extract by LC-ESI-MS^n. Compounds **1**, **2** and **3** were detected at ppm to ppb trace level in SIM and SRM MS^2 mode.

[1] P. Larignon and B. Dubos, *European Journal of Plant Pathology*, **103**, 147-157, 1997
[2] J.-M. Renaud, G. Tsoupras and R. Tabacchi, *Helv. Chim. Acta*, **72**, 929-932, 1989
[3] C. El Modafar, A. Clerivet, A. Fleuriet, J.-J. Macheix, *Phytochemistry*, **34** (5), 1271-1276, 1993

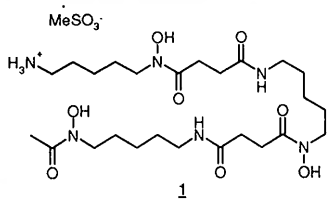
Medicinal Chemistry **17**

CGP 72670, a potent, orally available iron chelator

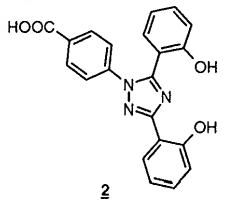
P. Acklin, R. Lattmann, P. Bühlmayer, A. Crowe, B. Faller, Y. Jin, H.P. Nick, T. Sergejew, C. Spanka, A. Wong, P. Zbinden, and H.P. Schnebli.

Novartis Pharma AG, Nervous System,
Postfach, CH-4002 Basel, Switzerland

People affected by the hereditary disease β-Thalassaemia have in-stable hemoglobin and are blood transfusion dependent. Desferal® (**1**) is the only save drug to prevent lethal iron accumulation at present. However, due to nescessity for 8 to 10 hours of infusion daily, it has a very low compliance.
The goal of the iron chelator project was therefore to identify an orally available, selective and non-toxic iron chelator.
In order to find an optimum between charge, size, and stability, computer assisted molecular modeling focused on the design of tridentate iron chelators by linking strong iron ligating groups in a geometry that was supposed to be optimal for iron binding. Among others, derivatized bis-hydroxyphenyltriazoles were proposed as potential iron chelators by CAMM. CGP 72670 (**2**) was identified as a strong and orally available iron chelator with efficacies up to 30 % in the bile duct cannulated rat as well as in the Marmoset model, showing only very low toxic effects even in long term studies.
This talk will cover the design and synthesis as well as the physicochemical and pharmacological properties of the iron sequestering agent (**2**).



1



2

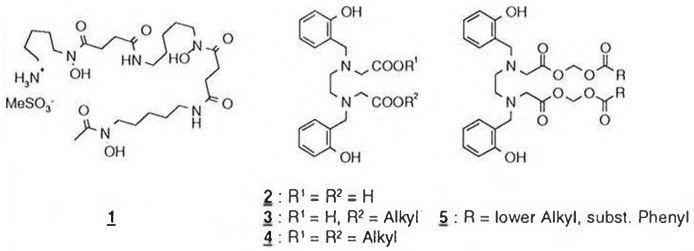
Medicinal Chemistry **18**

HBED-half and prodrug esters as orally active iron sequestering agents

C. Spanka, P. Acklin, P. Bühlmayer, A. Crowe, B. Faller, Y. Jin, R. Lattmann, H.P. Nick, T. Sergejew, A. Wong, P. Zbinden, W. Schilling, and H.P. Schnebli.

Novartis Pharma AG, Metabolic and Cardiovascular Diseases,
Postfach, CH-4002 Basel, Switzerland

The only drug on the market to treat iron overload is DESFERAL® (**1**) which has a very low oral bioavailability and has to be given by daily 8 hour continuous s.c. or i.v. infusions. Like **1**, HBED (**2**) has long been known to be a high affinity ligand for ferric ions, but with insufficient oral activity in humans. However, oral bioavailability can be improved substantially by masking of the carboxylate functionalities in **2**. Simple HBED diesters **4** showed improved but still insufficient *in vivo* activity. Therefore, in an optimization program further derivatives from complex prodrug esters **5** to alkyl mono-esters **3** were prepared and tested for their capability to induce iron excretion after oral administration in rats and marmoset monkeys. A most surprising observation was that only one carboxylate group needs to be esterified to achieve good oral bioavailabilty. Also, the HBED mono-esters **4** are quite stable in plasma and form strong hexadentate neutral iron complexes that can be extracted by organic solvents. The synthesis, SAR, and pharmacological profile of these novel HBED derivatives will be presented.



1

2: $R^1 = R^2 = H$
3: $R^1 = H$, R^2 = Alkyl
4: $R^1 = R^2$ = Alkyl
5: R = lower Alkyl, subst. Phenyl

Medicinal Chemistry **19**

Stereoeffective Radical Cyclizations on the Route to Trehazolamine

P. Zillig, A. Boiron, B. Giese
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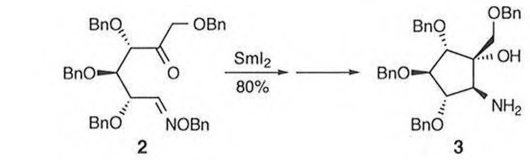
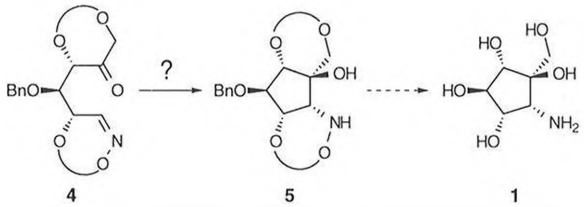
St.Johanns-Ring 19, CH-4056 Basel

Trehalase is an enzyme that hydrolyses the disaccharide trehalose and is widely distributed in microorganisms, insects, plants and animals. An inhibitor of this enzyme, trehazolin, was isolated 1991 from the culture broth of a *Micromonospora* strain. A biomimetic synthesis of trehazolamine (**1**), the non-sugar part of trehazolin, starts from ketooxime **2**. But the radical cyclization reaction leads to the diepimer **3** of trehazolamine (**1**).



2 **3**



4 **5** **1**

In order to achieve the desired stereoselectivity, the directing effect of the adjacent oxygen functions are utilized [1]. It will be discussed how the formation of *cis*-fused rings (**4** → **5**) in the radical cyclization step facilitates the stereoselective synthesis of trehazolamine (**1**).

[1] A. Boiron, P. Zillig, D. Faber, B. Giese, *J. Org. Chem.*, in press.

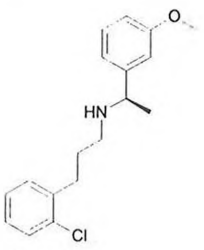
Medizinische Chemie **20**

Discovery of a new class of compounds strongly stimulating cell proliferation of osteoblasts in vitro

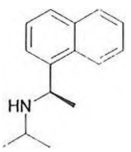
R. Waelchli, M. Christen, K. Seuwen and R. Gamse

Novartis Pharma AG, Preclinical Research, 4002 Basle, Switzerland

Calcium and other ions have been reported to stimulate proliferation of osteoblast cells via activation of a calcium sensor or receptor [1]. Agonists at the parathyroid calcium receptor, like the "calcimimetic" NPS R-568, did however not increase thymidine incorporation in osteoblast indicating that they are not stimulating osteoblast proliferation. During the testing of analogous compounds to NPS R-568, SDZ 117-755 was identified as stimulator of thymidine incorporation in two osteoblast cell lines. Starting from SDZ 117-755 a chemistry program was initiated with the aim to find compounds with higher potency and efficacy. The results of this derivatization program (SAR, most potent compounds, CombiChem approach, possible mechanism of action) will be presented and discussed.



NPS R-568



SDZ 117-755

[1] D. Quarles, J.E. Hartle, J.P. Middleton, J. Zhang, J.M. Arthur, J.R. Raymond, J. Cell Biochem. 56, 106, (1994)

Medizinische Chemie **21**

Neue Hemmer der Dihydrofolsäure Reduktase

Clemens Broger, Philippe Guerry, Peter Hartman, Christian Hubschwerlen, Synèse Jolidon, Hans Locher, Christian Oefner, Jean-Luc Specklin, Henri Stalder und Pierre Wyss

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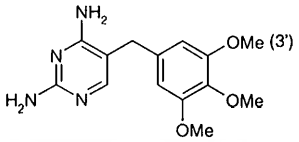
Die Bekämpfung von mehrfach resistenten Staphylokokken stellt eine wichtige und immer schwierigere Aufgabe der Infektiologie dar. Obwohl viele Methicillin-resistente Staphylokokken gegenüber Trimethoprim (TMP) und dessen Kombination mit Sulfamethoxazol empfindlich sind, hat sich die TMP-Resistenz in den letzten Jahren drastisch erhöht. Die kürzliche Aufklärung des TMP-Resistenzmechanismus und die vorhandenen 3D-Strukturen der Komplexe des Trimethoprims mit seinem Zielenzym, der Dihydrofolsäure Reduktase (DHFR; EC 1.5.1.3), haben uns veranlasst, Hemmer gegen sensitive und resistente Staphylokokken Enzyme zu entwerfen und zu synthetisieren.

Wir haben gefunden, dass die Einführung von lipophilen Substituenten in Position 3'des Trimethoprims Verbindungen liefert, welche eine hohe Affinität gegenüber sensitiven und mutierten Enzymen zeigen. Die 3D-Strukturen vieler Komplexe wurden aufgeklärt und haben unsere Strategie und den Entwurf neuer Hemmer stark beeinflusst. Mehrere Verbindungen zeigen gegenüber Gram-positiven Bakterien, insbesondere gegen Staphylokokken, eine hervorragende *in vitro* Aktivität. Im Septikämie-Mausmodell zeigen die besten Verbindungen eine dem Vancomycin (Goldstandard gegen Staphylokokken) vergleichbare Aktivität. Die Synthesen, Evaluation und Struktur-Aktivitätsbeziehungen werden diskutiert.



(TMP)

Medicinal Chemistry **22**

Substituted 5,7-Diphenyl-pyrrolo[2,3D]pyrimidines: Potent and Specific Inhibitors of the Tyrosine Kinase PP60 c-Src

Martin Missbach, E. Altmann, L. Widler, J. Green, M. Susa.

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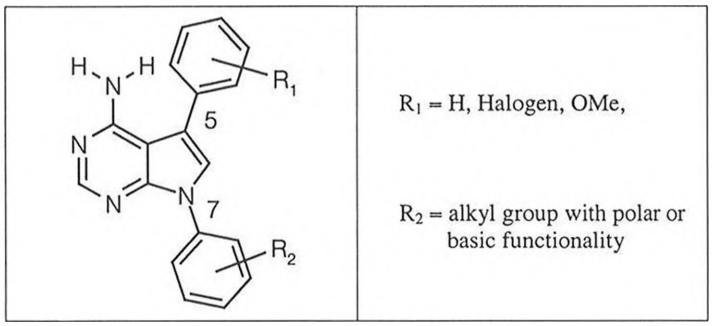
Inhibitors of tyrosine kinase signalling are of potential use in a variety of diseases. 5,7-diphenyl-pyrrolo[2,3d]-pyrimidines represent a class of highly potent inhibitors of the tyrosine kinase c-Src (IC50 <50nM) with reasonable specificity against a panel of different tyrosine kinases covering receptor and non-receptor tyrosine kinases as well as some serine/threonine kinases. The substitution pattern on the two phenyl rings determines not only potency (and serves as a handle to modulate physicochemical properties) but also specificity against other kinases. According to CAMM the 5-phenyl ring locks into a hydrophobic pocket at the ATP binding site. This interaction is crucial for good potency. Our optimization strategy resulted in potent, specific and water-soluble inhibitors of the tyrosine kinase c-Src with good cellular activity.



Medicinal Chemistry **23**

Structural and molecular studies on the p53-hdm2 interaction

C. García-Echeverría[1], P. Furet[1], M.J.J. Blommers[2], A. Böttger[3], V. Böttger[3], D.P. Lane[3], and P. Chène[1]

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The p53 tumor-suppressor protein causes G1 arrest or apoptosis and may enhance DNA repair in response to DNA damage and various other cellular insults. Previous reports have suggested that cell proliferation might depend on a fine balance between expression of the human double minute 2 (hdm2) oncogene and the p53 tumor-suppressor protein. This is due to an autoregulatory feed back loop for p53 activity: hdm2 is transcriptionally activated by p53, and the hdm2 oncoprotein binds the *N*-terminus of p53 preventing p53 from interacting with the transcriptional machinery. Recent publications have shown that disruption of the p53-hdm2 interaction results in a dramatic activation of p53 function and p53 protein accumulation. The disruption of this protein-protein interaction in tumors with wild-type p53 is therefore an attractive approach for cancer therapy.
We have used phage display peptide libraries to isolate novel hdm2 binding peptide sequences. Using synthetic peptides and sensitive binding assays, we have been able to identify novel molecules that bind to hdm2 with greatly increased affinity over the native p53 sequence. A remarkably clear set of results obtained by transfer NOE experiments and *in vitro* evaluation of peptides has established the key amino acid specificities of hdm2's binding pockets. This approach represents a clear route towards the molecular characterisation of the p53-hdm2 interaction and the design of small synthetic molecules that disrupt this protein-protein interaction.

Medicinal Chemistry **24**

Strategies toward Identification of Novel and Selective Protein Kinase Inhibitors

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Oncology Research, Novartis Pharma AG, 4002 Basel

Protein kinases, a large family of at least 200 members, play a crucial role in signal transduction as well as in cellular proliferation, differentiation and various regulatory mechanisms. The inhibition of a growth related kinase may therefore provide a new therapy for diseases such as cancer. The ATP-binding site of protein kinases has been identified as an interesting target for the rational design of kinase inhibitors.
We have built-up a pharmacophore model of the ATP-binding site of the EGFR kinase and used it for the rational design of kinase inhibitors. Thereby, phenylamino-pyrrolo-pyrimidines, a new class of highly potent and selective inhibitors of the EGFR kinase, have been identified and optimized. The most active derivatives inhibited the EGFR tyrosine kinase with IC50 values between 1-10 nM. In EGF-dependent cell systems, tyrosine phosphorylation as well as c-fos mRNA expression was inhibited with similar IC50 values. Further successful application of this pharmacophore model led to the identification of phenylamino-pyrazolo-pyrimidines another class of potent, selective and ATP-competitive EGFR kinase inhibitors with IC50 values in the low nM range. SAR of this class will also be discussed.

CHIMIE THERAPEUTIQUE **25**

Modeling Studies and Asymmetric Synthesis of Hydrosolubles Analogues of GalCer, a HIV-1 Cell Receptor.

Renaud Villard, Guillaume Delapierre, Frédéric Foriadu, Gérard Buono*

Laboratoire de Synthèse Asymétrique, ENSSPICAM, Faculté des Sciences de St Jérôme 13397 Marseille, France

Galactosylceramide (GalCer) is a cellular receptor involved in the recognition process between HIV-1 and target cells lacking CD4 receptor. It is composed of a galactose head, an α-hydroxyfattyacid with *R* absolute configuration and 2*S*,3*R*-sphingosine. This glycosphingolipid specifically binds to gp120, a surface glycoprotein of the virus.
To study this molecular interaction, we proposed to correlate the basic conformation of synthetic hydrosoluble analogues with their affinity with the gp120 measured *in vitro*.

Molecular mechanic revealed a specific fundamental conformation of GalCer and, above a critical length of alkyl chains, the basic conformation of analogues is strickly superposable to the GalCer one.

Thus we developed an asymmetric synthesis of analogues with shortened alkyl chains, potentially hydrosoluble, in order to be able to carry out biochemical tests.[1]

The compounds obtained present an sufficient hydrosolubility to enable us to carry out biological tests and they are good model compounds to study molecular recognition with HIV-1 gp120.

[1] Villard, R. ; Fotiadu, F. ; Buono, G. *Tetrahedron Asymmetry* **1998**, *9* 607-611.

Medizinische Chemie **26**

CGP 3466 and Related Dibenzo[b,f]oxepin Derivatives with Neurorescuing Properties and the Synthesis of Tools for Target Identification

Kaspar Zimmermann[†], Silvio Roggo[†], Claudia Betschart[†], William G. Tatton[‡], Peter Fürst[†] and Peter Waldmeier[†]

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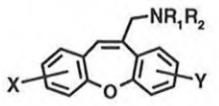
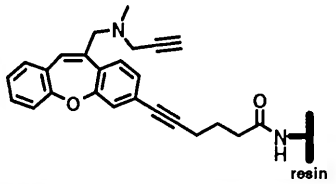
[‡]Department of Neurology, The Mount Sinai Medical Center, New York, N.Y. 10029-6574, USA

Dibenzo[b,f]oxepin derivatives, such as CGP 3466 (N-methyl-N-propargyl-10-aminomethyl-dibenzo[b,f]oxepin) have been discovered in a screen for antiapoptotic compounds in partially differentiated, trophically withdrawn PC12 cells. A series of 10-amino-dibenzoxepines with different side-chain substitution patterns and with substituents on the aromatic rings were synthesized. Neurorescuing, antiapoptotic properties at low nanomolar concentrations were found for selected compounds, rendering them into potential drug candidates for neurodegenerative diseases.
In order to pinpoint the molecular target of such compounds an array of tools for target identification has been prepared. The syntheses, structure-activity relationsships and the results of the target identification program will be presented.





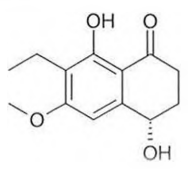
Medizinische Chemie **27**

Synthesis of orally active 5-HT$_{2C}$ receptor antagonists

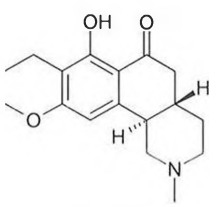
J. Wichmann, M. Bös, H. Stadler, F. Jenck, J.R. Martin, J.-L. Moreau, and A.J. Sleight

Pharma Division, Preclinical CNS Research, *F. Hoffmann-La Roche Ltd.*

Due to its relative brain specificity and pattern of distribution, the 5-HT$_{2C}$ receptor offers an innovative target for designing drugs for the treatment of neuropsychiatric disorders in which the serotonergic system is involved. Serotonin (5-HT) receptor antagonists which bind preferentially to the 5-HT$_{2C}$ receptor are receiving increasing attention. Potential therapeutic targets of 5-HT$_{2C}$ receptor antagonists include anxiety, sleep disorders and migraine.
O-Methylasparvenone (Ro 09-1809), a 5-HT$_{2C}$ receptor antagonist with moderate affinity (pKi = 6.7) was isolated from an *Aspergillus parvulus* Smith broth and found to be selective with respect to other 5-HT receptors as well as a variety of other receptors. However, it was inactive *in vivo* even after intracerebroventricular administration.



O-Methylasparvenone
Ro 09-1809



Ro 60-0759

The design and synthesis of orally active 5-HT$_{2C}$ receptor antagonists with high affinity (e.g. Ro 60-0759, pKi = 8.0) based on the nitrogen-free lead structure O-Methylasparvenone will be presented.

Medicinal Chemistry **28**

Pyrazinoylguanidine Derivatives as Ligands for the Neuropeptide Y Y1 Receptor Subtype

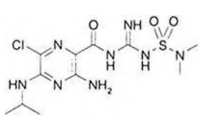
P. Rigollier, H. Rüeger, T. Schmidlin, W. Schilling, S. Whitebread, H. Rogg, M. Chiesi and L. Criscione

Metabolic and Cardiovascular Diseases, Novartis Pharma AG CH-4002 Basel, Switzerland

Neuropeptide Y (NPY) is a 36 amino acid peptide and has been the focus of intensive biological investigations since its discovery as the most abundant peptide in the mammalian brain. It is present in a highly conserved manner across species and is involved in many biological effects in both the periphery and the central nervous system, where it acts on multiple receptor subtypes.

The Y1 subtype is well documented. The pressor responses induced by NPY have been shown to be mediated by this receptor subtype. Therefore, non-peptide NPY Y1 antagonists could offer new treatments for hypertension and other cardiovascular disorders.

Screening of our corporate compound library identified 1 as a potential lead structure (IC_{50} = 2.6 μM, human Y1 SK-N-MC whole-cell assay). After extensive optimization, CGP 66891A was prepared and shown to have nanomolar affinity for the human Y1 receptor (IC_{50} = 6.4 nM, SK-N-MC membrane assay). Synthesis, structure-activity relationships and *in vivo* activity of CGP 66891A will be presented.



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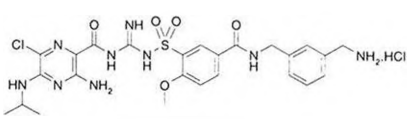


CGP 66891A

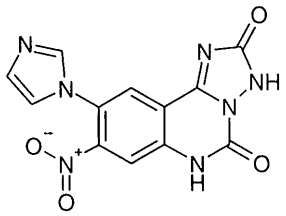
Medicinal Chemistry **29**

Triazoloquinazolinediones: A Novel Class of Potent Glycine-Site Directed NMDA and AMPA Receptor Antagonists

René Wyler, Bernd Büttelmann, Thierry Godel, Marie-Paule Heitz, Vincent Mutel, Claus Riemer

Pharmaceutical Research, Preclinical Neurosciences, F. Hoffmann-La Roche AG, CH-4070 Basel

Antagonists of excitatory amino acid receptors have found considerable interest as potential therapeutic candidates for the treatment of neurological disorders such as stroke, traumatic brain injury, epilepsy and Parkinson's disease. In a program aimed at developing glycine-site directed NMDA (N-methyl-D-aspartate) receptor antagonists, a series of novel triazoloquinazolinediones were identified showing a dual mode of action at NMDA as well as at AMPA (2-amino-3-(5-methyl-3-hydroxyisoxazol-4-yl)propanoic acid) receptors. This led to the identification of Ro 48-8587, one of the most potent and selective AMPA receptor antagonists.



Ro 48-8587

Synthesis, structure activity relationships and in vivo activities of this new class of compounds will be presented.

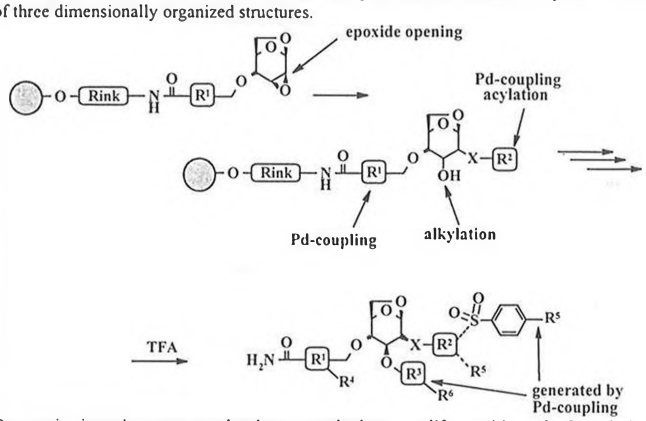
Medicinal Chemistry **30**

Levoglucosane as a Scaffold for Combinatorial Chemistry

Wolfgang K.-D. Brill, Alain De Mesmaeker, Sebastian Wendeborn

Novartis Pharma AG, Combinatorial Chemistry, S-507.3.12, CH-4002 Basel

Levoglucosane is an attractive scaffold for combinatorial chemistry. It allows modifications evolving all carbons of the skeleton. The resulting diversomers cover a very diverse array of three dimensionally organized structures.



Our main intention was to develop a method to modify positions 2, 3 and 4 of levoglucosane. These diversifications began upon immobilization of the levoglucosane 2,3-epoxide onto polystyrene beads. Subsequently followed the selective opening of the extremely stable 2,3 epoxide on the acid labile bicyclic scaffold with various alcohols, amines and mercaptanes.[1] The resulting compounds bearing alcohol and amino functionallities could be N- and O-alkyled or acylated. Certain aryl groups, introduced in previous steps, which bear iodo functions were modified further using Pd mediated couplings with acetylenes, boronic acids and tributylstannanes.[2]

[1] W. K.-D. Brill, D. Tirefort, *Tetrahedron Lett.* **1998**, *39*, 787-790
[2] a) T. I. Wellow, B. M. Novak, *J. Org. Chem.* **1994**, 59, 5034-5037; b) E. M.Campi, W. R. Jackson, S. M. Marcuccio, C. G. M. Naeslund, *J. Chem. Soc. Chem. Commun.* **1994**, 2395; c) D. M. Hodgson, J. Witherington, B. A. Moloney, I. C. Richards, J.-L. Brayer, *Synlett* **1995**, 32-34; d) D. Fancelli, M. C. Fagnola, D. Severino, A. Bedeschi, *Tetrahedron Lett.* **1997**, 38, 2311-2314.

Medizinische Chemie **31**

Synthesis, Conformational Properties, and Immunogenicity of a Cyclic Template-Bound Peptide Mimetic Containing an NPNA Motif from the Circumsporozoite Protein of *P. falciparum*

Ernst Freund‡, Christian Bisang‡, Luyong Jiang‡, Fabienne Emery‡, Christian Bauch§, Hugues Matile§, Gerd Pluschke§, and John A. Robinson‡

Institute of Organic Chemistry‡, University of Zürich, Winterthurerstrasse 190, 8057 Zürich, and Swiss Tropical Institute§, Socinstrasse 57, 4002 Basel, Switzerland.

The immunodominant central portion of the circumsporozoite (CS) surface protein of the malaria parasite *Plasmodium falciparum* contains a tetrapeptide motif, Asn-Pro-Asn-Ala (NPNA), tandemly repeated almost 40 times. The three-dimensional structure of the CS protein, including the central repeat region, is presently unknown. We have investigated an approach to stabilize β-turns in a single NPNA motif, by its incorporation into a template-bound cyclic peptide comprising the sequence ANPNAA. The template was designed to stabilize β-turns in the peptide loop, and to allow its conjugation to T-cell epitopes in a multiple-antigen-peptide. NMR studies and MD simulations with time-averaged NOE-derived upper distance restraints support the formation of a stable β-I turn conformation in the NPNA motif of this template-bound antigen. BALB/c mice immunized with a multiple-antigen-peptide containing four copies of the template-bound loop conjugated to a single universal T-cell epitope produced antibodies that bound *P. falciparum* sporozoites in immunofluorescence assays. These results provide further support for the immunological relevance of a type-I β-turn conformation based on the NPNA cadence in the repeat region of the CS protein, and illustrate the use of a novel template for the evaluation of conformationally constrained peptide immunogens [1].

[1] Bisang, C.; Jiang, L.; Freund, E.; Emery, F.; Bauch, C.; Matile, H.; Pluschke, G.; Robinson, J. A. *J. Am. Chem. Soc.* submitted

Medizinische Chemie **32**

On the Importance of Being Aromatic at an Antibody-Antigen Interface. Mutagenesis Studies of the A6-Interferon γ Receptor Complex

Luyong Jiang, Klaus Hofstädter, Fiona Stuart, Jan W. Vrijbloed and John A. Robinson

Institute of Organic Chemistry, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland.

In this work, we have studied by mutagenesis a complex formed between the extracellular human interferon gamma receptor (hIFNγR) and the Fab fragment of the neutralizing antibody A6. The epitope bound by A6 was revealed in a crystal structure of hIFNγR domain-1 (residues 1-108 with a Cys105Ser mutation) complexed to the Fab fragment of A6 at 2.8 Å resolution [1]. Five CDRs of the A6 antibody interact primarily with the CC' surface loop of the receptor, from Lys^{47} to Trp^{56}, although contact is also made with residues in the neighbouring F strand, in particular with Trp^{82}. 21 receptor mutants have been prepared and their affinity for A6 has been monitored using a BIAcore instrument, as well as by solution-phase competition ELISA [2]. The results point to the importance of two lysine side chains (K^{47} and K^{52}), an asparagine side chain (N^{53}), and two aromatic side chains (Y^{49} and W^{82}) in the receptor for recognition by A6. The role of aromatic side chains in antibody-antigen recognition is of particular interest, not least in this case because a total of 13 aromatic groups (six Tyr, six Trp and one His) are present at the interface (four in V_L, six in V_H and three in the receptor), and several are proximal to the charged and polar side chains of K^{47}, K^{52} and N^{53} in the receptor.

[1] Sogabe, S. et al., *J. Mol. Biol.* 1997, *273*, 882-897.
[2] Hofstädter, K.; Stuart, F.; Vrijbloed, W.; Robinson, J. A. (1998) submitted

Medizinische Chemie **33**

Structural Mimicry of Recognition Loops on a Cytokine Receptor using Cyclic Peptides and the Templating Effect of a Heterochiral Diproline

Michel Favre, Julia Späth, Fiona Stuart, Luyong Jiang and John A. Robinson

Institute of Organic Chemistry, University of Zürich, Winterthurerstrasse 190, 8057 Zürich, Switzerland.

Straightforward and effective methods of stabilizing an antiparallel β-sheet loop have been explored, using as an example the CC' surface loop of the extracellular interferon γ receptor. The loop sequence was grafted from the protein onto a heterochiral D-Pro.L-Pro dipeptide template, as well as a diketopiperazine-based organic template. For comparison, a disulfide bridged loop has also been prepared. In agreement with earlier studies (J. W. Bean et al., *J. Am. Chem. Soc.* 1992, *114*, 5328; D. K. Chalmers et al., *J. Am. Chem. Soc.* 1995, *117*, 5927), the D-Pro.L-Pro dipeptide template is shown to strongly fix a turn conformation. Relatively slow peptide amide H/D exchange rates, and a network of medium range NOE connectivities indicate that the residues directly attached to this template structurally mimic corresponding residues in adjacent antiparallel β-strands in the protein. MD simulations with and without time-averaged distance restraints support this view, and indicate that the tip of the loop is more flexible. The templating effect of the heterochiral diproline unit also promotes efficient backbone cyclization of the linear peptide precursor, suggesting that a wide variety of related protein loop mimetics should be readily accessible [1,2].

[1] Späth, J.; Stuart, F.; Jiang, L.; Robinson, J. A. (1998) submitted.
[2] Favre, M.; Möhle, K.; Pfeiffer, B.; Jiang, L.; Robinson, J. A., unpublished

Inorganic Chemistry **34**

Why do lipids slow the reaction of ONOOH with zeaxanthin?

R. Scheidegger, Patricia L. Bounds and W. H. Koppenol

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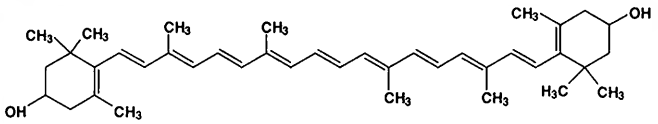
The oxygenated carotenoids zeaxanthin (**1**) and lutein may offer protection against or repair of oxidative damage to the macular area of the retina. Since both superoxide and nitrogen monoxide, which react to form peroxynitrite, are found in the retina, we studied the reaction of peroxynitrite with zeaxanthin.



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Zeaxanthin was dissolved in acetonitrile, or incorporated into liposomes constructed from L-α-dimyristoyl-phosphatidylcholine (C14:0) [1]. The reaction of peroxynitrite with zeaxanthin in acetonitrile was more than one hundred times faster than the reaction in liposomes. As peroxynitrite rapidly permeates phopsholipid membranes [2], a lipid-dependent reduction in rate of two orders of magnitude is surprising.

We also compared the temperature dependence of the reaction in acetonitrile and in liposomes and found the activation energy to be lipid dependent. Although peroxynitrous acid doesn't react directly with the lipid, the lipid clearly influences the rate of reaction with the carotenoid.

[1] Scheidegger, R., Pande, A.K., Bounds, P.L., and Koppenol, W. H. (1998) *Nitric Oxide Biol. Chem.* **2**, 8-16.
[2] Marla, S.S., Lee J., and Groves, J.T. (1997) *Proc. Natl. Acad. Sci. USA* **94**, 14243-14248.

Inorganic Chemistry **35**

Approaches to heteroleptic terpyridine complexes

Edwin C. Constable, Catherine E. Housecroft, Emma Schofield and Yves Zimmermann

Laboratory for Supramolecular Chemistry, Institute of Inorganic Chemistry, University of Basel, CH-4056 Basel

In the course of our studies on the assembly of dendrimers containing 2,2':6',2''-terpyridine (tpy) metal-binding domains, we wished to develop selective routes using labile metal centres as an assembly principle. This necessitated the development of new synthetic methodologies for the preparation of tpy complexes with labile metal centres. Various approaches to such complexes were studied:

(i) statistical mixing of metal ions and ligands (X, Y)

$$M^{n+} + X + Y \rightarrow [MXY]^{n+} + [MX_2]^{n+} + [MY_2]^{n+}$$

(ii) exchange of ligands with a metal complex

$$[MX_2]^{n+} + Y \rightarrow [MXY]^{n+} + [MY_2]^{n+} + X$$

(iii) exchange of ligands between complexes

$$[MX_2]^{n+} + [MY_2]^{n+} \rightarrow [MXY]^{n+}$$

The separation of the complexes by HPLC was achieved and properties of the iron(II) and cobalt(II) complexes will be described.

Inorganic and Coordination Chemistry **36**

HYPERBOLIC TILINGS AND CHEMICAL NETWORKS

Stefano Leoni, Reinhard Nesper

Lab. für Anorg. Chem., ETH Zürich, Universitätsr. 6, CH-8092 Zürich

The topological organisation of periodically structured matter can be described and understood in a very effective and elegant way by using Periodic Nodal Surfaces (PNS) [1,2]. PNS are generated by short Fourier summations, involving only a small set of reflections in reciprocal space. The choice of reflections near the origin of reciprocal space and of characteristic intrinsic symmetry for a particular space group reduces the sometimes enormous amount of detail a structure may contain to its general organisation. The roots of the resulting density spaces generate a family of continuous, orientable, 3-periodic surfaces. Strong covalent networks like those in zeolites develops along such curved 2D manifolds [1,2].
Working on the curved shape of such Periodic Nodal Surfaces, hyperbolic tilings corresponding to open framewoks can be generated. On the one hand such tilings are projections of covalent netwoks placed in the labyrinths, onto the surface: The network of analcime tiles the gyroide surface in a $[6^24^2]$ network, faujasite can be projected similarly on a diamond surface, and one part of the clathrate structure as well. On the other hand, graphitic networks can be generated, where rigid units, like hexagonal tiles, correspond to places of higher point symmetry, for example around 3-fold axes on planar portions of the surface, and more flexibly to saddle points, like four- and eight-rings[3].
Different tilings on Periodic Nodal Surfaces will be shown, and their relation to hyperbolic chemical networks will be stressed. Transformation relating different tiling will also be presented, and their topological implications discussed

[1] H.G.v.Schnering, R.Nesper, Z.Phys. **B83**, 407(1991)
[2] H.G.v.Schnering, R.Nesper, Angew. Chem. Int. Ed. Engl. **26**, 1059(1987)
[3] S.Leoni, Dissertation, Zürich 1998, to be published.

Chimie minérale et de coordination **37**

New Parameters for MM+ Force Field for Pyridine and Pyrazine Compounds.

P.Goetzen, H.Stoeckli-Evans, M.Posel

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Ave. Bellevaux 51, 2000 Neuchâtel

Before any computational study on molecular properties can be carried out, a molecular model needs to be established. Molecular mechanics method seems to be a good starting point method. The quality of results depends on the parameters used in the calculations. Some new parameters have been added to an existing MM+ force field (HyperChem) to improve geometry optimization calculations for compounds containing pyridine, pyrazine and their complexes. The parameters have been obtained on the basis of the data extracted from the Cambridge Structural Database.

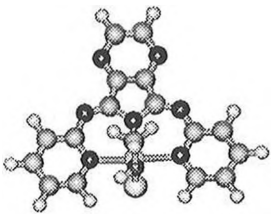

Fig. 1 Optimized model of ZnCl[(5,7-bis(2-aminopyridine)-5H-6,7-dihydropyrrolo[3,4-b]pyrazine)](CH$_3$OH)

Anorganische Chemie und Koordinationschemie **38**

Calculation of hole sizes with sumconstraints

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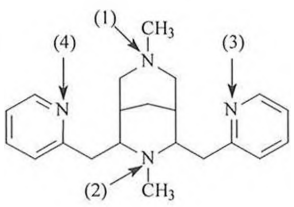
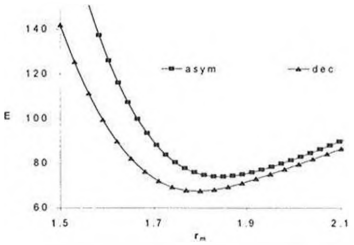
The Decoupled Energy module, a new tool to calculate macrocyclic hole sizes using constraints for the sum of metal-ligand bond lengths has been developed and implemented in the molecular mechanics program MOMEC.

For the calculation of the strain energy and the geometry of the ligand, only metal-ion independent parameters are considered, and the asymmetry must not be assumed. Comparisons with established methods are based on the bispidine-type ligand B



Ligand B



Energy E vs. average metal-ligand bond length r_m

The optimized geometry is considered to be that with the lowest strain energy for the ligand and the corresponding sum of bond lengths is a measure of the cavity.

Anorganische Chemie und Koordinationschemie **39**

New H-bonded Polymers of Alkaline Earth Metal Compounds

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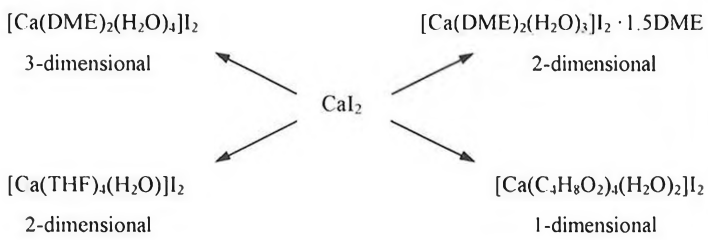
Inorganic polymers of alkaline earth metal compounds built up by covalent bonds have been the object of recent investigations [1]. However, several alkaline earth metal compounds form polymers via H-bonds between H_2O-molecules and iodide, allowing for different dimensionalities. These will be shown as their single crystal structures. Dimensionality is influenced by the different bridging capacities of the iodide ions. Due to the anisotropy of their solid state structures, different chemical and physical properties are expected which are of tremendous interest in the search for new materials.



[1] K. M. Fromm, *Angew. Chem.* **1997**, *24*, 2876

Inorganic and Coordination Chemistry **40**

Synthesis and Structural Studies of Platinum-η^3-allyl Complexes

Lukas Hintermann, Pascal Maire, and Antonio Togni

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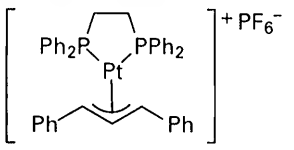
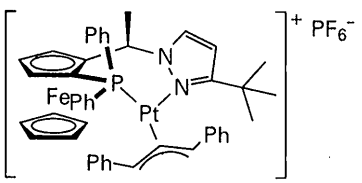
The reaction of 1,3-diphenylallyl-bromide with *Karstedt*-catalyst, an easily available triolefin-platinum(0) species [1], gives dimeric 1,3-diphenylallyl-platinum(II)-bromide (**1**).

Reaction of **1** with chelating PN or PP ligands followed by halide-abstraction yields cationic platinum-η^3-allyl-complexes. Compounds **2** and **3** were synthesised following this protocol and using a new method for halide abstraction. Their structure was determined by X-ray analysis, as was for the palladiumanalogue of **3**.



2



3

The platinum complex **3** was found to be a catalyst for allylic alkylation, but not for allylic amination. For this reason, **3** may serve as a tool for mechanistic investigations of palladium-catalysed enantioselective allylic amination reactions [2].

[1] P. B. Hitchcock, M. F. Lappert, N. J. W. Warhurst, *Angew. Chem.* **1991**, *103*, 439.
[2] A. Togni, U. Burckhardt, V. Gramlich, P. S. Pregosin, R. Salzmann, *J. Am. Chem. Soc.* **1996**, *118*, 1031; U. Burckhardt, Dissertation ETH Nr. 12167, Zürich 1997.

Inorganic Chemistry **41**

Facile Route to Iron Bound Ketene Units

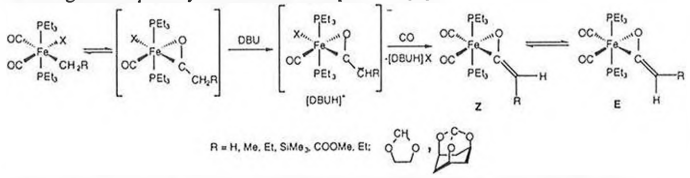
H. Kandler, W. Bidell, M. Huttenloch, M. Jänicke, M. Knickmeier, D. Veghini and H. Berke

Anorganisch-Chemisches Institut der Universität Zürich, Winterthurerstr. 190, CH-8057 Zürich, Switzerland

Synthetic access to ketene ligands via a C-C coupling route can be achieved by carbonylation of carbene complexes or by deprotonation of metal acyl species, which in turn can be obtained by a CO insertion step. Our approach to ketene complexes aimed at the utilization of the latter pathway applying $Fe(CO)_2(PEt_3)_2$ fragments, from which haloacyl derivatives $Fe(CO)_2(PEt_3)_2(Hal)COR$ and the "parent" alkyl carbonyl molecules $(Fe(CO)_2(PEt_3)_2(Hal)(R)$ are known. A metal-mediated buildup of ketene moieties could thus be envisaged by the following formal C-C coupling process:

$$CHR^1R^2(Hal) + CO \xrightarrow[-BH(Hal)]{B} R^1R^2C{=}C{=}O$$

The aforementioned iron acyl or alkyl compounds can be prepared by an oxidative addition process starting from alkyl halides and $Fe(CO)_2(PEt_3)_2(N_2)$ or $[Fe(CO)_2(PEt_3)_2]_2N_2$. The acyl complexes (see Scheme) can be deprotonated by DBU and in the presence of CO forming subsequently the ketene compounds [1].



For R = H, Me, Et, $SiMe_3$, the ketene complexes are unstable losing the ketene unit in the presence of CO to from $Fe(CO)_3(PEt_3)_2$. For R = COOMe, Et an additional isolable type of species of dicarbonyl(1-alkoxy-1,3-dioxopropen-3-yl)bis(triethylphosphane)iron was discovered to participate in the equilibration process with the E, Z ketene complexes.

[1] H. Kandler, W. Bidell, M. Jänicke, M. Knickmeier, D. Veghini and H. Berke, Organometallics **17**, 960 (1998).

Inorganic Chemistry **42**

Towards Organometallic Dendrimers

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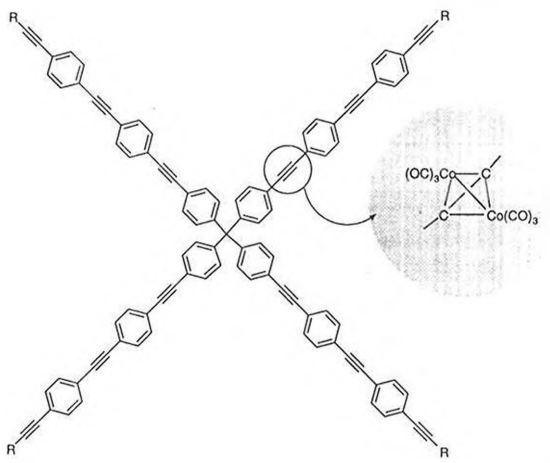
Tetraphenylmethane derivatives containing varying numbers of ethynylphenylene chains have been prepared, and the corresponding tetrahedral Co_2C_2-clusters isolated and characterized.



E.C. Constable, O. Eich, C.E. Housecroft and L.A. Johnston, *Chem. Commun.*, 1998 submitted.

Inorganic Chemistry **43**

NITROSYL *VERSUS* HYDRIDE REACTIVITY IN THE RHENIUM COMPLEXES $[Re(H)(NO)_2(PR_3)_2]$ (R = ^{i}Pr, Cy)

Angela Llamazares, Georg Artus, Heinz Berke*

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Transition metal complexes containing both hydride and nitrosyl ligands are expected to display unusual properties, especially an enhanced hydridic reactivity.[1,2] As part of our current research concerning the chemistry of such complexes, we have synthesized the rhenium derivatives $[Re(H)(NO)_2(PR_3)_2]$ (R = ^{i}Pr (**1a**), Cy (**1b**)).[3]

A study of the reactivity of compounds **1a,b** with electrophiles like BF_3 or H^+ has shown that the reactions occur either at the hydride or at the nitrosyl sites. The NO groups are exceptionally basic and thus, one or two equivalents of BF_3 can coordinate to one nitrosyl ligand via the oxygen (first equivalent) and the nitrogen (second equivalent) atoms. The products obtained in the reactions with protic acids depend on the nature of the acid employed. With $HBF_4{\cdot}OEt_2$ reduction of one nitrosyl to a hydroxylaminato fragment (NH_2O^-) is achieved while the metal bond hydride remains. In contrast to that, evolution of H_2 occurs with CF_3SO_3H and covalent rhenium triflate derivatives are formed.

Treatment of complexes **1** with the hydride abstracting agent $[Ph_3C][BAr'_4]$ (Ar' = 3,5-$(CF_3)_2C_6H_3$) produces binuclear (R = ^{i}Pr) or mononuclear 16 e$^-$ (R = Cy) cationic species. The binuclear derivative results from the interaction of a $[Re(H)(NO)_2(PR_3)_2]$ molecule with the 16 e$^-$ fragment $[Re(NO)_2(PR_3)_2]^+$ through a Re–NO–>Re linkage. Some catalytic and stoichiometric reactions of these compounds will be discussed.

[1] H. Berke, P. Burger, *Comments Inorg. Chem.* **1994**, *16*, 279.
[2] B. E. Bursten, M. G. Gatter, *J. Am. Chem. Soc.* **1984**, *106*, 2554.
[3] D. G. Gusev, A. Llamazares, G. Artus, H. Berke, *submitted for publication.*

Inorganic/Coordination Chemistry **44**

The influence of the C-terminal loop length on the rhombicity of cupredoxines

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Cupredoxines or blue copper proteins are redox proteins with an electron transfer function in the respiratory chain of several organisms. Two new loop-mutants have been expressed, based on the redox active blue copper protein amicyanin from Paracoccus versutus. The target of the mutations was the C-terminal loop of the protein (Fig.1) that contains three of the four coordinating amino acids, a cysteine, a methionine and a histidine. This loop was exchanged against the one found in Pseudomonas aeruginosa azurin (AmiAzu) and the one from Alcaligenes faecalis pseudoazurin (AmiPaz). The two mutants show a rhombic behavior with a ratio of the absorptions in the UV/Vis (A_{460}/A_{600}) of 0.19 and 0.28, respectively, while the wild-type protein is of axial symmetry with an A_{460}/A_{600} of 0.1. It could be shown that the A_{460}/A_{600} ratios of the mutants increase significantly at low temperatures, that is, the rhombicity seems to increase. Molecular modeling is used to clarify the influence of the loop length on the rhombicity of the site.

Fig. 1 - Amicyanine chromophore

Anorganische Chemie-Koordinationschemie **45**

BISMACROCYCLIC FERROCENE-CONTAINING LIGANDS AND THEIR DICOPPER(I) COMPLEXES

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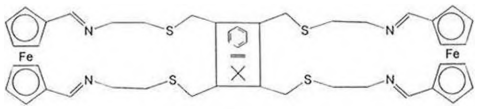
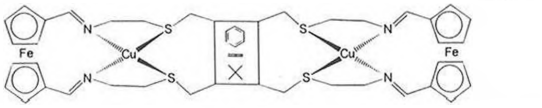
The synthesis of three new tetra-Schiff base bismacrocyclic ligands with a $(S_2N_2)_2$ donor set (N=imin), bearing two ferrocene end groups and three different spacer groups (benzene, ethene and $C(CH_2)_4$) (**1**) are reported. The molecular structure of the benzene ligand has been determined by single crystal X-ray analysis. We also describe the formation of the dicopper(I) complexes (**2**). The electrochemical and spectroscopic data indicate a weak Fe-Cu interaction



1



2

Anorganische Chemie-Koordinationschemie **46**

Manganese Superoxide Dismutase: Model Compounds as Stabilizing Agents For Aliphatic Polyamides

Peter Comba, Charis Katsichtis and Hans Pritzkow

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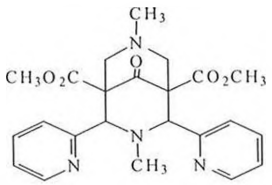
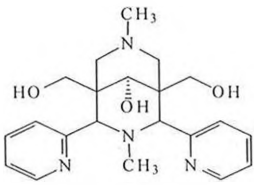
e-mail: katsichtis@akcomba.oci.uni-heidelberg.de

The degradation and yellowing of aliphatic polyamides under the influence of heat, humidity and oxygen are well documented phenomena. Although the exact mechanisms of these processes and the nature of the oxidized groups are still unknown, it has been postulated that hydroperoxo species and aliphatic radicals are directly involved.

In a search for the appropiate stabilizing agents, the enzyme manganese superoxide dismutase (Mn-SOD) may play an important role. This deactivates the superoxide radicals by converting them to hydrogenperoxide and oxygen. Compounds of the ligands **1** and **2** with various counter ions are synthetized and characterized. The spectroscopic, magnetic and electrochemical properties of these compounds are correlated with their experimentally determined structural parameters and the polyamide stabilization is compared to that of various other compounds.



1



2

Inorganic Chemistry **47**

Reaction of MeCpMn(dmpe)I with Alkynes: New Routes to 17- and 16-Electron Dinuclear Manganese Complexes

S. Kheradmandan, V.V. Krivykh and H. Berke*

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Based on a three-component reaction of the manganese half-sandwich complex [MeCpMn(dmpe)I][1] with P(III) ligands and alkynes, we have developed a new approach to Mn(II) alkynyl complexes. Treatment of two equiv. of MeCpMn(dmpe)I with one equiv. of Me_3Sn-X-$SnMe_3$ (X = -C≡C-, -C≡C-C≡C-, -C≡C-C_6H_4-C≡C-) in thf followed by the addition of two equiv. of dmpe (dmpe = 1,2-bis(dimethylphosphino)ethane) gave the dinuclear low-spin d^5 manganese complexes **1-3** in good yields (40-70 %). The compounds [**1-3**] are air and moisture sensitive in the solid state and in solution.

$$2\ \underset{(+II,\ d^5,\ high\text{-}spin)}{MeCpMn(dmpe)I} + 1\ Me_3Sn\text{-}X\text{-}SnMe_3 + 2\ dmpe \xrightarrow{r.t.,\ thf} -2\ MeC_5H_4SnMe_3$$

$$\underset{(+II/+II,\ d^5,\ low\text{-}spin)\ [1\text{-}3]}{[\{1\text{-}Mn(dmpe)_2\}_2(\mu\text{-}X)]} \underset{Cp_2Co}{\overset{Cp_2Fe^+PF_6^-}{\rightleftharpoons}} \underset{(mixed\ valence)\ [1\text{-}3]^{+\cdot}}{[\{1\text{-}Mn^{I}(dmpe)_2\}_2(\mu\text{-}X)]^{+\cdot}\ PF_6^-}$$

$$\underset{(+III/+III)\ [1\text{-}3]^{2+}}{\overset{Cp_2Fe^+PF_6^-}{\rightleftharpoons}\ [\{1\text{-}Mn(dmpe)_2\}_2(\mu\text{-}X)]^{2+}\cdot 2PF_6^-}$$

The complexes **1-3** can be oxidized reversibly applying two equiv. of $Cp_2Fe^+PF_6^-$ to yield the dicationic systems $[1\text{-}3]^{2+}\cdot 2PF_6^-$. The monocationic complexes $[1\text{-}3]^{+\cdot}\cdot PF_6^-$ are presumably intermediates in these reactions. The $[1\text{-}3]^{2+}\cdot 2PF_6^-$ with 16-electron centres behave like diamagnetic complexes (e.g. giving rise to diamagnetic NMR spectra). Detailed physical measurements are in progress for the elucidation of this phenomenon.

[1] Köhler F.H., Hebendanz N., Müller G., Thewalt U., *Organometallics* **1987**, 6, 115-125.

Inorganic Chemistry **48**

Synthesis and Molecular Structure of Saturated and Unsaturated Triruthenium Cluster Containing Three Tricyclohexylphosphine.

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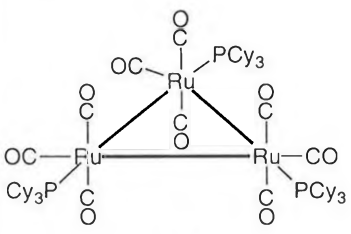
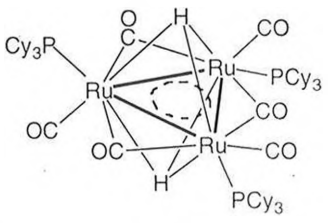
Institut de Chimie, Université de Neuchâtel, CH-2000 Neuchâtel

The reaction of $[Na][HRu_3(CO)_{11}]$ with an excess of tricyclohexylphosphine in methanol affords, depending on the reaction conditions, the trisubstituted cluster $[Ru_3(CO)_9(PCy_3)_3]$ (**1**) (48e) and $[H_2Ru_3(CO)_6(PCy_3)_3]$ (**2**) (44e), inaccessible hitherto.



(1)



(2)

Complex **2** is highly unsaturated lacking 4 electrons with respect to the noble gas shell (48e) and represents the first example of a 44e Ru_3 cluster. This high electron-deficiency is presumably stabilised by the bulky tricyclohexylphosphine ligands.

The molecular of **1** and **2** will be presented and the reaction mechanism will be discussed.

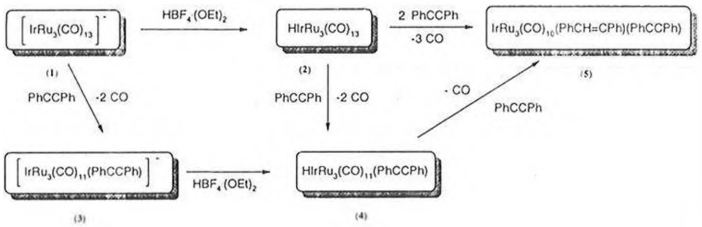
Inorganic Chemistry **49**

Reaction of the mixed metal clusters $[IrRu_3(CO)_{13}]^-$ and $HIrRu_3(CO)_{13}$ with diphenylacetylene. Synthesis of new tetrahedral and butterfly alkyne complexes

Vincent Ferrand, Antonia Neels, Helen Stoeckli-Evans and Georg Süss-Fink*

Université de Neuchâtel, Institut de Chimie, Avenue de Bellevaux 51, CH-2000 Neuchâtel.

The thermal reaction of the anionic cluster $[IrRu_3(CO)_{13}]^-$[1] (**1**) with PhCCPh affords the butterfly complex $[IrRu_3(CO)_{11}(PhCCPh)]^-$ (**3**). Protonation of **3** gives the neutral tetrahedral complex $HIrRu_3(CO)_{11}(PhCCPh)$ (**4**) which is also accessible by reaction of the neutral cluster $HIrRu_3(CO)_{13}$[1] (**2**) with one equivalent of PhCCPh in refluxing hexane.



Reaction of the tetrahedral alkyne cluster **4** with one further equivalent of PhCCPh gives the butterfly cluster $IrRu_3(CO)_{10}(PhCCPh)(PhCH{=}CPh)$ (**5**), also accessible from **2** with two equivalents of PhCCPh. The three complexes **3**, **4** and **5** are characterised by spectroscopic methods and by X-ray diffraction.

[1] Georg Süss-Fink, Susanne Haak, Vincent Ferrand and Helen Stoeckli-Evans, *J. Chem. Soc., Dalton Trans.*, **1997**, 3861.

Inorganic Chemistry **50**

Reactivity of Mixed-Metal Cluster Anion $[M_3Ir(CO)_{13}]^-$ towards Phosphines: Synthesis and Characterisation of the New Clusters $HM_2Ir(CO)_5(dppm)_3$ (M = Os, Ru)

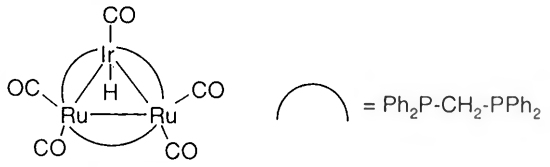
Susanne Haak and Georg Süss-Fink*

Institut de Chimie, Université de Neuchâtel, CH-2000 Neuchâtel

Recently we reported the synthesis of the mixed-metal cluster anion $[Ru_3Ir(CO)_{13}]^-$ (**1**) from $Ru_3(CO)_{12}$ and $[Ir(CO)_4]^-$ [1]. The analogous reaction of the osmium carbonyl leads to the triosmium-iridium anion $[Os_3Ir(CO)_{13}]^-$ (**2**).

$$Os_3(CO)_{12} + [Ir(CO)_4]^- \longrightarrow [Os_3Ir(CO)_{13}]^- + 3\,CO$$

Reaction of **1** or **2** with bis(diphenylphosphino)methane (dppm) in methanol affords, with fragmentation of the tetranuclear metal framework, the trinuclear hydrido clusters $HRu_2Ir(CO)_5(dppm)_3$ (**3**) and $HOs_2Ir(CO)_5(dppm)_3$ (**4**) which are neutral, the methanol being the protonation agent.



3

The molecular structures of **2** and **3** as well as reactions with other phosphines will be presented.

[1] G. Süss-Fink, S. Haak, V. Ferrand, H. Stoeckli-Evans, *J. Chem. Soc., Dalton Trans.*, **1997**, 3861.

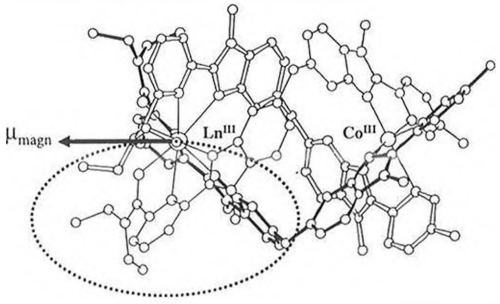
Chimie Minérale et de Coordination **51**

Paramagnetic Lanthanide Metal Ions as Intramolecular Structural Probes in Supramolecular Complexes in Solution

S. Rigault, G. Bernardinelli and C. Piguet

University of Geneva, Department of Inorganic Chemistry and Laboratory for X-ray Cristallography, CH-1211 Geneva

The almost complete shielding of 4f electrons by filled 5s and 5p orbitals in lanthanide metal ions, Ln^{III}, provides paramagnetic centers with very limited spin delocalisation in coordination and supramolecular complexes. The separation of contact (through-bond effects) and *pseudo*-contact (through-space effects) contributions to the NMR lanthanide induced paramagnetic shift (LIS) is straightforward under these conditions, but a direct access to axial coordinates of the NMR-active nuclei in supramolecular complexes is strongly limited by (i) inaccessible crystal field parameters and (ii) non-linear correlations betweeen distances and angles in the dipolar term.[1] We present here the application of various paramagnetic NMR techniques (spin-Curie relaxation, magnetic anisotropy, variable temperature paramagnetic shift) combined with X-ray crystallography for the complete structural and electronic characterization of the supramolecular non-covalent lanthanide podates $[LnCoL_3]^{6+}$ (Ln = Ce-Yb) in acetonitrile.



[1] C. Piguet, J.-C.G. Bünzli, G. Bernardinelli, G. Hopfgartner, S. Petoud, O. Schaad, *J. Am. Chem. Soc.* **1996**, 118, 6681.

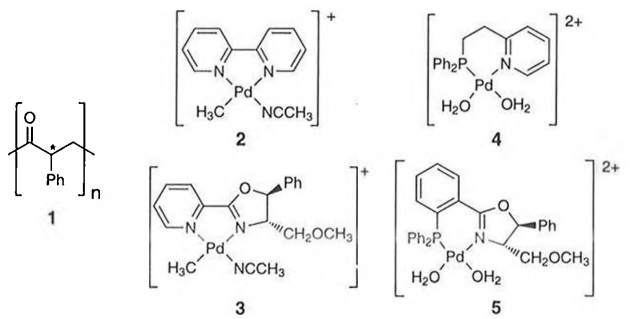
Inorganic and Coordination Chemistry **52**

Stereocontrol in the Alternating Copolymerization of Styrene and Carbon Monoxide

Anton Aeby, Achim Gsponer and Giambattista Consiglio

Laboratorium für Technische Chemie, ETH-Zentrum, CH-8092 Zürich

The stereochemistry of the alternating copolymerization of styrene (and *para*-substituted styrenes) with carbon monoxide to poly[1-oxo-2-phenyl-propane-1,3-diyl] **1** catalyzed by cationic Pd(II)-complexes can be largely controlled. Whereas **2** yields a syndiotactic copolymer (content of *u*-diads ~90%) by chain end control [1], with systems containing chiral phosphanyl-dihydrooxazole-ligands [2] (such as the newly synthesized **5**) highly isotactic **1** is formed. Similarly high enantioface discrimination is observed in the terpolymerization of ethene, styrene and carbon monoxide using **5** (based on chiroptical properties). Thus the stereogenic center of the last inserted styrene unit does not influence significantly the enantioface discrimination, which is controlled by the enantiomorphic site. Catalyst system **4** gives atactic **1** [2], whereas the prevailing stereochemistry produced by **3** is essentially syndiotactic [1]. These results infer the overwhelming significance of a site selective coordination of the olefin for an efficient enantioface discrimination.



[1] a) M. Brookhart, M.I. Wagner, G.G.A. Balavoine, H.A. Haddou, *J. Am. Chem. Soc.* **1994**, *116*, 3641. b) P. Corradini, C. De Rosa, A. Panunzi, G. Petrucci, P. Pino, *Chimia* **1990**, *44*, 52.

[2] M. Sperrle, A. Aeby, G. Consiglio, A. Pfaltz, *Helv. Chim. Acta* **1996**, *79*, 1387.

Inorganic Chemistry **53**

Selective Nitration of Toluene with Acetylnitrate and Zeolites

D. Vassena, A. Gsponer, S. Bernasconi, T. Schmid, A. Kogelbauer, and R. Prins

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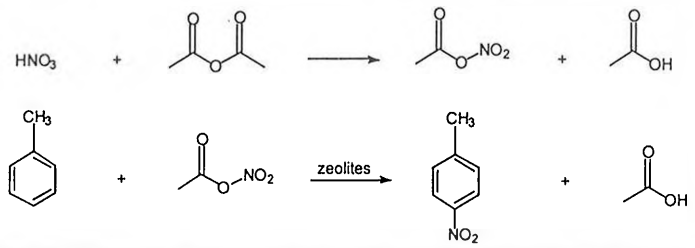
Based on the work of Smith et al. [1], we investigated the nitration of toluene with different zeolites and acetyl nitrate. The nitrating agent was generated in situ from nitric acid and acetic anhydride. Because of the shape-selectivity of zeolites the process may allow shifting the product composition in favour of the generally more desirable *para*-nitrotoluene.



Zeolite H-beta was the most selective catalyst. An outstandingly high para-to-ortho ratio for nitrotoluenes of up to 40 was obtained with a 10-fold excess of nitrating agent in the presence of acetic anhydride. Under similar conditions dinitrotoluenes were obtained in 50% yield that strongly decreased when stoichiometric amounts of aromatic and nitrating agent were used. These results indicate that also with acetic anhydride a rapid poisoning or diluting effect of the acidity of the solid takes place, most likely caused by the formation of acetic acid as a reaction product.

[1] K. Smith, A. Musson, G. A. DeBoos, *J. Chem. Soc., Chem. Commun.*, (1996) 469.

Inorganic Chemistry **54**

Preparation of Iron-Containing MFI-Zeolites as Catalyst for the Selective Catalytic Reduction (SCR) of Nitrogen Oxides

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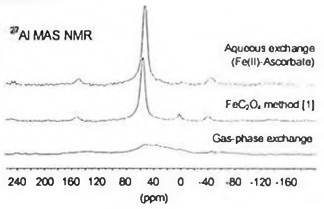
Over-exchanged Fe-ZSM5 (Fe(II)/Al ratio =1.85) has recently been demonstrated to be a durable SCR catalyst for the removal of NOx from combustion streams [1]. Its major advantage compared to Cu- and Co-exchanged zeolites is its insensitivity towards water and SO_2. $Fe(OH)^+$ moieties in cationic positions and the absence of Brønsted acidity were regarded as the key factors for its exceptional catalytic properties.

In this study several types of iron exchange methods were attempted on different forms of MFI zeolites: aqueous solution ion exchange, solid–state ion exchange (SSIE), reductive SSIE, and gas-phase exchange.

Characterization of the catalysts was performed with AAS, FTIR, ^{1}H-, ^{27}Al-, ^{29}Si-MAS NMR, XRD, EXAFS and TGA/DSC techniques. Preparation of the catalyst according to [1] resulted in the formation of Brønsted acid sites and iron oxide aggregates inside the pores. No evidence for Fe(II) in cation-exchanged positions was found. Aqueous exchange with different combinations of ferrous/ferric complexes (i.e. Fe(II)-ascorbate Fe(II)-citrate-N_2H_4) led to low exchange degrees (Fe/Al≤1). Such behaviour was ascribed to the formation of anionic iron complexes in solution, which prevent the replacement of the original cations.

A higher iron loading and a limited formation of Brønsted acid sites was obtained using the gas-phase exchange. NMR spectra were strongly affected by the paramagnetic properties of dispersed iron in close vicinity to the aluminium atoms.



[1] X. Feng and K. Hall, *J. Catal.* **1997**, 166, 368-376.

Anorganische Chemie **55**

Influence of Chelating Ligands on the Structure and Activity of NiMo Hydrotreating Catalysts

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Supported NiMo hydrotreating catalysts are used in the refining industry for the removal of sulphur and nitrogen from oil feedstock. In the present research project, the performance of SiO_2 supported NiMo catalysts is investigated through the hydrodesulphurisation of thiophene at atmospheric pressure. Previous work [1] showed that, when adding nitrilotriacetic acid (NTA) to the precursor catalysts during the preparation procedure, the activity of the derived catalysts experienced a dramatic improvement. In the present research project, it is shown that other chelating ligands, like ethylenediamine (EN), ethylenediaminetetraacetic acid (EDTA) and 18-crown-6, have a similar beneficial effect. The effect of the ligands is already visible for ligand to nickel ratios below 0.5. EXAFS, UV-VIS and Raman spectroscopy were employed to explain what structural changes cause this improvement in the activity. EXAFS showed that the surrounding of nickel as well as molybdenum is very much influenced by the presence of the ligands. Nickel is better dispersed and forms interactions with the support. UV-VIS measurements showed that some of the atoms coordinated to Ni belonging to the chelating agents are exchanged for oxygen atoms of the support. A combination of the Raman and EXAFS results showed that Mo is present on the support as polymolybdate clusters ($Mo_7O_{24}^{6-}$, $Mo_8O_{26}^{4-}$). A fraction of these clusters interacts with the support, although it was not possible to distinguish the kind of interaction formed between Mo and SiO_2. β-12-molybdosilicic acid was observed only in the catalyst precursor containing exclusively Mo.

[1] L. Medici, R. Prins, *J. Catal.* **1996**,163, 28.

Anorganische Chemie **56**

Entstickung von Toluidin und Cyclohexylamin auf NiMo-Katalysatoren

Fabio Rota und Roel Prins

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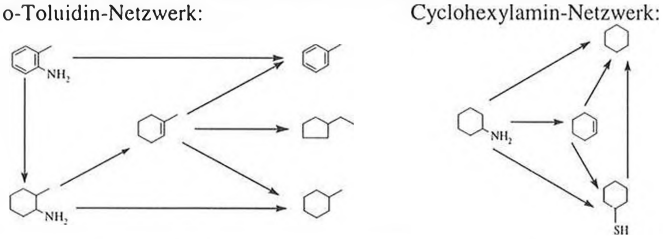
Ziel der Untersuchung ist es, die katalytische Entstickung von Rohölfraktionen am Beispiel von Modellkomponenten zu studieren. Als Modellmoleküle werden o-Toluidin und Cyclohexylamin benutzt und als Katalysator wird hauptsächlich NiMo/γ-Alumina verwendet. Die Reaktion von o-Toluidin setzt sich aus verschiedenen Teilschritten zusammen:

o-Toluidin-Netzwerk: Cyclohexylamin-Netzwerk:



Die Kinetik dieser zwei Netzwerke wird studiert. Ziel ist die Bestimmung der Adsorptionskonstanten der verschiedenen Moleküle mit Hilfe eines Langmuir-Hinshelwood-Ansatzes. Es ist weiter die Hypothese zu überprüfen, ob es unterschiedliche katalytische Stellen an den NiMo-Katalysatoren gibt, an denen die Hydrierung des aromatischen Rings, die Hydrierung der Doppelbindung und die C-N-Spaltung stattfinden. Um die C-N-Spaltungsreaktion zu studieren, wird das Cyclohexylamin-Netzwerk untersucht. Die Vermutung liegt nahe, dass es sich um eine Substitution der Amingruppe durch eine Sulfidgruppe handelt. Die Sulfidgruppe kann man gasförmig (H_2S) oder auf der Katalysatoroberfläche finden. Noch wichtiger ist es, die Rolle des Ammoniaks im ganzen Netzwerk zu bestimmen. Die Bildung von Ammoniak könnte die Adsorption der verschiedenen Moleküle auf dem Katalysator beeinflussen.

Inorganc and Coordination Chemistry **57**

Factors Influencing Enantioselectivity in the Palladium-Catalyzed Heck-Arylation using Pyrazole-Containing Ferrocenyl Ligands

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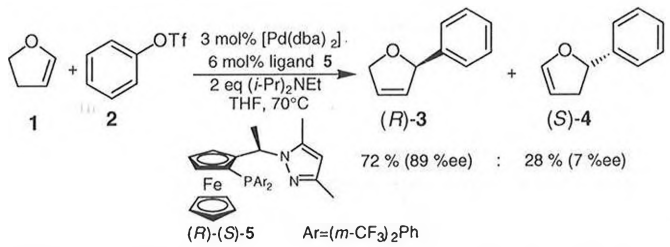
Chiral chelating P,N-ligands afford very good regio- and enantioselectivity in the Heck-arylation of 2,3-dihydrofuran.[1] [2]



Utilizing our pyrazole containing ferrocenyl ligands[3] (e.g. **5**) two major effects on the enantioselectivity have been observed:
1) Variable enantiomeric excesses for both products **3** and **4** were obtained as a function of conversion.
2) The triflate anion forming during the catalytic reaction was found to be responsible for this „ee-drift".[4] Using ligand **5** and adding 1 eq of a triflate salt (e.g. NBu_4OTf or $HNEt(i\text{-}Pr)_2OTf$) it was possible to increase the enantioselectivity for the major isomer **3**.

References

[1] O. Loiseleur et al., *Angew. Chem.* **1996**, *108*, 218
[2] O. Loiseleur et al., *Synthesis* **1997**, 1338
[3] U. Burckhardt et al., *Organometallics* **1995**, *14*, 5415
[4] For similar effects, see: F. Ozawa et al., *Organometallics* **1993**, *12*, 4188

Inorganic and Coordination Chemistry **58**

Olefin / Aldehyde Cooxidation Catalyzed by $[RuCl(P\text{-}P)_2]^+$

Arianna Martelletti and Antonio Mezzetti

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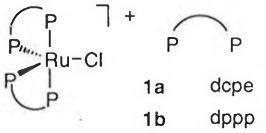
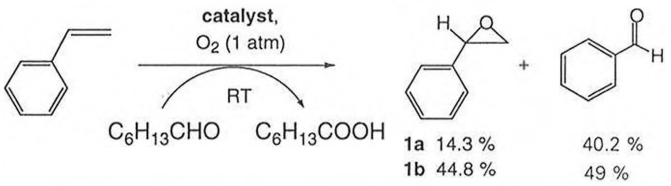
Recently, we have found that $[RuH(\eta^2\text{-}O_2)(dcpe)_2]^+$(**2**) catalyzes the epoxidation of olefins in the presence of aldehyde as a co-reductant [1]. In view of the successful application of **1b** in olefin epoxidation with terminal oxidants [2], we have tested **1a,b** as catalyst precursors for the cooxidation of styrene and heptanal with molecular oxygen:





Styrene conversion is quantitative with both **1a,b** as catalysts (1 mol%, 6 h reaction time, aldehyde:styrene ratio = 1:4). The selectivity in styrene oxide is 14 and 45% for **1a** and **1b**, respectively. Benzaldehyde and rearrangement products of the epoxide (acetophenone, 1-phenylethanal) are also formed (total of 46% for **1a**; 6% for **1b**). After completion of the reaction, **1b** is the major P-containing species in the reaction solution (> 90%), whereas for **1a** only dcpe oxide is detected by ^{31}P NMR spectroscopy. Other substrates are under investigation and will be presented.

[1] A. Martelletti, A. Mezzetti, PP-B24, *10th International Symposium on Homogeneous Catalysis*, ISHC 10, Princeton, New Jersey, 1996.
[2] M. Bressan, A. Morvillo, *J. Chem. Soc., Chem. Commun.*, **1998**, 650.

Inorganic and Coordination Chemistry **59**

Asymmetric Olefin Cyclopropanation Catalyzed by Bis(diphosphino) Complexes of Ruthenium(II)

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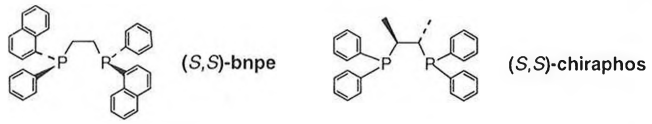
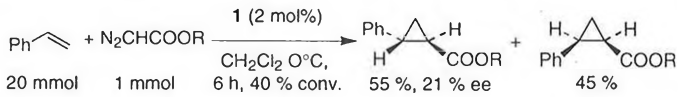
Laboratorium für Anorganische Chemie, ETH Zürich, CH-8092 Zürich

We are investigating the use of chiral 16 electron complexes of ruthenium(II) in asymmetric catalysis. As part of this study, we have prepared the five-coordinate species $[RuCl((S,S)\text{-bnpe})_2]PF_6$ (**1**) and $[RuCl((S,S)\text{-chiraphos})_2]PF_6$ (**2**) by reaction of the corresponding $[RuCl_2(P\text{–}P^*)_2]$ with $TlPF_6$. Enantiomerically pure (*S,S*)-bnpe, which contains stereogenic P atoms, has been prepared as described previously [1].



Complexes **1** and **2** catalyze the asymmetric cyclopropanation of styrene with ethyl diazoacetate:



An enantiomeric excess of 21% is observed with **2**. No chiral induction is obtained with **1** under the same conditions. Complexes **1** and **2** are also active in the epoxidation of olefins. However, the selectivity in epoxide is low (20% in the case of *E*-β-methylstyrene), and no enantioselectivity is observed.

[1] R. M. Stoop, A. Mezzetti, F. Spindler, *Organometallics*, **1998**, *17*, 668.

Inorganic and Coordination Chemistry **60**

Dioxygen Activation by Five-Coordinate $[OsX(dcpe)]^+$ Complexes

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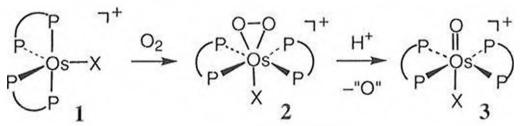
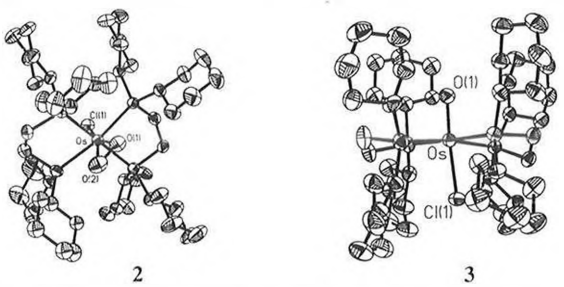
The unsaturated d^6 complexes $[OsX(dcpe)_2]^+$ (dcpe=1,2-bis(dicyclohexylphosphino)ethane; X = Cl, **1**; Br, **1**) react with O_2 forming the stable dioxygen derivatives **2** [1]. We now find that complexes **2** eliminate one oxygen atom in the presence of acid and form the surprisingly stable oxo complexes $[OsX(O)(dcpe)_2]^+$ (**3**), the first Os(IV) oxo species reported:



The above reaction can be exploited for the oxidation of an added substrate. Thus, **2** oxidize $[Bu_4N]I$ to triiodide and PPh_3 to Ph_3PO. Complex **2** also oxidizes activated organic substrates such as TCNE or substituted aromatic compounds. Both **2** and **3** have been characterized by X-ray analysis:



[1] A. Mezzetti, E. Zangrando, A. Del Zotto, P. Rigo, *J. Chem. Soc., Chem. Commun.* **1994**, 1597.

Inorganic and Coordination Chemistry **61**

Stereogenic P Atoms for Asymmetric Catalitic Hydrogenation

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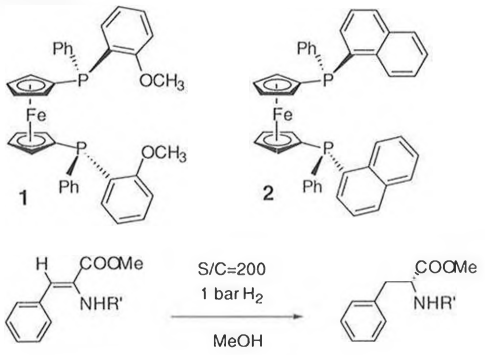
[a] Laboratorium für Anorganische Chemie, ETH Zürich, CH-8092 Zürich
[b] Novartis Services Ltd, CH-4002 Basle

The diphosphine ligands **1** and **2**, bearing stereogenic P atoms, have been prepared in high yields and enantiomeric purity [1,2]. The system formed *in situ* from $[Rh(NBD)_2]BF_4$ and the ligands **1,2** catalyzes the asymmetric hydrogenation of dehydroaminoacids with moderate to high enantiomeric excess:



R' = C(O)Me (*R*)

1 / $Rh(NBD)_2]BF_4$ (1:1), 35°C, 18 h, >99.5% conv, **91% e.e.**

2 / $[Rh(NBD)_2]BF_4$ (1:1), 15°C, 17 h, >99.0% conv, **59% e.e**

Ligands **1** and **2** react with $[Rh(COD)_2]BF_4$ giving $[Rh(COD)(1)]BF_4$ and $[Rh(COD)(2)]BF_4$: their application in catalysis will be reported.

References

[1] R. M. Stoop, A. Mezzetti, T. Y. H. Wong, F. Spindler, A. Mezzetti, *OMCOS 9*, Göttingen (D), July 20-25 1997, P 291.

[2] U. Nettekoven, M. Widhalm, P. C. J. Kamer, P. W: N. M. van Leeuwen, *Tetrahedron: Asimmetry*, **1997**, *8*, 3185.

Inorganic and Coordination Chemistry **62**

STERIC AND ELECTRONIC CONTROL IN THE PD-CATALYSED ENANTIOSELECTIVE HYDROSILATION WITH FERROCENYL BASED LIGANDS

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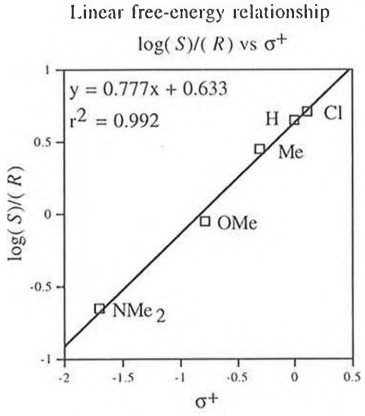
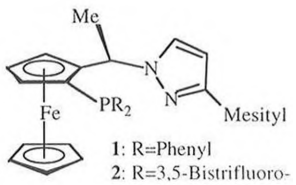
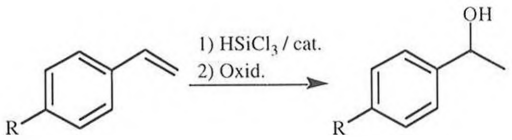
The Pd-catalysed hydrosilation of norbornene with $HSiCl_3$ using ferrocenyl ligands **1** and **2** affords enantioselectivities of 91%ee and 99%ee, respectively.



For *p*-substituted styrenes a linear free-energy correlation ($\log(S)/(R)$ vs σ^+) was found, indicating a polar transition state of the enantioselectivity determining step.



1: R=Phenyl
2: R=3,5-Bistrifluoro-methylphenyl



Inorganic and Coordination Chemistry **63**

Bi-nuclear Mercury(II) Complexes with (N_xS_y) Chelates

T. Assoumatine and H. Stoeckli-Evans

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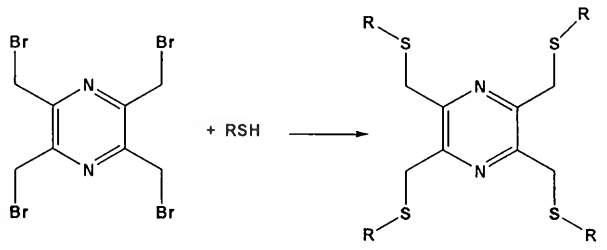
From 2,3,5,6-tetrakis(bromomethyl)pyrazine as starting material three new pyrazine derivatives have been synthesised :



R = Phenyl (L1), Pyridyl (L2), Methyl (L3)

Ligands **L1**, **L2** and **L3** are potential bis-tridentate ligands and as they all contain both hard N-donor and soft S-donor atoms, they are expected to display a certain structural diversity on complexation.

The reaction with $AgNO_3$ lead to the formation of one- and two-dimensional polymers in the case of **L1** and **L3**, respectively [1]. With mercury(II) salts all three ligands have been shown, by single crystal X-ray analysis, to give bi-nuclear complexes with surprisingly different coordination modes.

[1] T. Assoumatine & H. Stoeckli-Evans, NSCS, Lausanne, Oct 1997.

Inorganic and Co-ordination Chemistry **64**

5,6-bis(2'-pyridyl)-pyrazine-2,3-dicarboxylic acid co-ordination polymers with Cu(II)

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Ligand bridged multinuclear complexes have been extensively explored in an effort to achieve a more complete understanding of their potential physical properties such as electrical conductivity, magnetism and photochemical behaviour.

We have been working with substituted pyrazines as bridging ligands in order to obtain co-ordination polymers. Recently, four copper (II) one-dimensional co-ordination polymers $\{[Cu(L)(H_2O)_3]\cdot 5H_2O\}_n$, $\{[Cu(L)(H_2O)_3](ClO_4)\cdot 3H_2O\}_n$, $\{[Cu_2(HL)Cl_3]\ 2H_2O\}_n$ and $\{[Cu_2(HL)Br_3]\ 0.5H_2O\}_n$, bridged by 5,6-bis(2'-pyridyl)-pyrazine-2,3-dicarboxylic acid, (H_2L) have been synthesized. Herein we describe their synthesis, structure and magnetic properties.

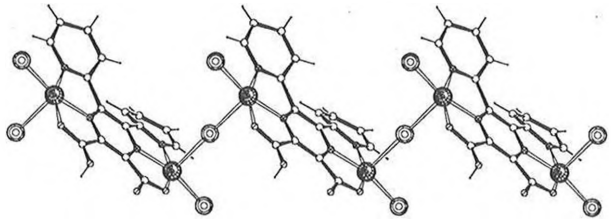

Figure 1. Zig-zag chain structure of $\{[Cu_2(HL)Br_3]\ 0.5H_2O\}_n$

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Inorganic and Coordination Chemistry **65**

Synthesis of Novel Substituted 2,2':6',2''-Terpyridines; a new Route to Dendrimeres

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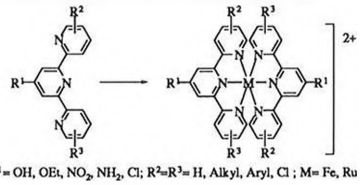
2,2':6',2''-Terpyridines are versatile ligands for the formation of metal complexes. Many 2,2':6',2''-terpyridines, substituted at the terminal pyridine rings, which bear, more importantly, functionalities directly attached to C(4') have been synthesised. Homo- as well as heteroleptic iron(II) and ruthenium(II) complexes of these ligands were prepared and their chemical and photochemical properties were investigated [1][2].



R^1= OH, OEt, NO_2, NH_2, Cl; R^2=R^3= H, Alkyl, Aryl, Cl ; M= Fe, Ru

[1] R.-A. Fallahpour and E. C. Constable, *J. Chem. Soc.; Perkin Trans. 1*, **1997**, 2263.

[2] R.-A. Fallahpour, *Eur. J. Inorg. Chem.* **1998**, in press.

Inorganic Chemistry **67**

Novel Ru(II) Polypyridine Complexes as Luminescent Reporters of DNA

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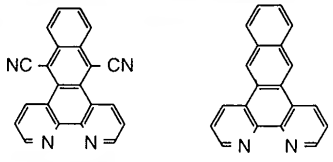
Novel transition metal complexes which react with nucleic acids are designed as new diagnostic and therapeutic agents. We have synthesized two new Ru(II) complexes, $Ru(dpan)(phen)_2^{2+}$ and $Ru(dc\text{-}dpan)(phen)_2^{2+}$ (dpan=dipyrido [3, 2 - a: 2', 3' - c] anthracene , dc-dpan= dipyrido [3, 2 - a: 2', 3' - c] anthracene - 9, 10 -dicarbonitrile), which bind to DNA.



dc-dpan dpan

The syntheses of the two ligands (dpan, dc-dpan) and complexes are presented. DNA binding has been examined via spectroscopic methods. The results of the absorption and emission measurements will be discussed.

Inorganic Chemistry **66**

Variation of the Rigid Spacer in Bridging Ligands with Phenanthroline: Geometric and Electronic Consequences

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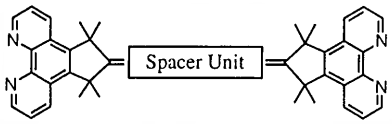
Bridging ligands of the type phenanthroline-spacer-phenanthroline with rigid spacers offers the possibility to prepare homo and hetero dinuclear complexes with Ruthenium and Osmium as metal centers. With such compounds we are able to study intramolecular electron and



energy transfer reactions after irridiation into the donor part of the metal complex. The nature of the spacers between the two phenanthroline moieties determines the dihedral angles, and consequently we expect that the energy or electron transfer properties will be influenced . We have used tetramethylcyclobutane (dihedral angle is 0°), stellane (45°), and adamantane (90°) as spacers.

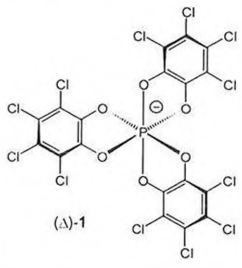
We discuss the synthesis of the new bridging ligand phenanthroline-stellane- phenanthroline and its corresponding complexes.

Inorganic and Coordination Chemistry **68**

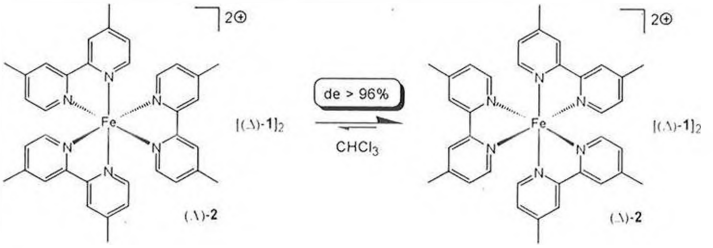
Highly Diastereoselective Ion Pairing of TRISPHAT Anions and Iron(II) Trisbisimine Complexes.

Jonathan J. Jodry, Catherine Ginglinger and Jérome Lacour*

Département de Chimie Organique, Université de Genève, 1211 Genève 4



The induction of optical activity on configurationally labile racemic cationic coordination complexes by optically active anions is an essential phenomenon.[1] Herein, we report that the induction from chiral anions onto a chiral cation can be an extremely efficient process: Two chiral anions (TRISPHAT, **1**) behave as efficient hosts controlling the chirality of a configurationally labile iron(II)tris(4,4'-dimethyl-2,2'-bipyridine) cationic guest (**2**) with high diastereoselectivity (de > 96%).[2] The nature of the association between the molecular propellers [homochiral (Δ-Δ) *vs.* heterochiral (Λ-Δ)], the influence of the substituents on the ligands, as well as the extension of this work to triple helices will be presented.



[1] a) S. Kirschner, N. Ahmad, C. Munir, R. J. Pollock, *Pure Appl. Chem.* **1979**, *51*, 913-923; b) B. Norden, F. Tjerneld, *FEBS Lett.* **1976**, *67*, 368-370.

[2] J. Lacour, J. J. Jodry, C. Ginglinger, S. Torche, *Angew. Chem.* **1998**, in press.

CHIMIA 52 (1998) Nr. 9 (September)

Inorganic Chemistry **69**

Stereoselective Formation of Circular and Linear Helicates

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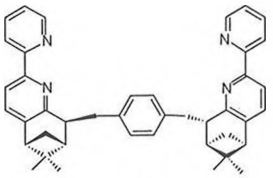
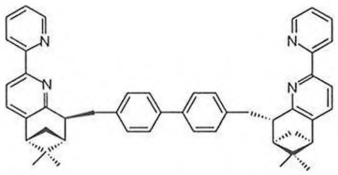
University of Fribourg, CH-1700, Switzerland

Helicates are a topic field in metallosupramolecular chemistry. New challenges come out now. The stereoselective synthesis as well as the control of self-assembly processes leading to linear and (or) circular helicates are only two examples.
Ligand **1** forms in reaction with labile metal centers Ag(I) and Cu(I), respectively, enantiomerically pure circular hexanuclear helicates [1].



1



2

In order to test the influence of the bridge length on the formation of circular architecture over the linear one, we synthesized the larger but geometrically very similar ligand **2.** The synthesis and the characterization of a linear helicate with Ag(I) will be presented.

[1] Mamula, O.; von Zelewsky, A.; Bernardinelli, G.; *Angew. Chem., Int. Ed.*, **1998**, *37*, 289.

Inorganic and Coordination Chemistry **70**

Chiral Ferrocenyl PP- or PN-Ligands Bound on Dendrimers

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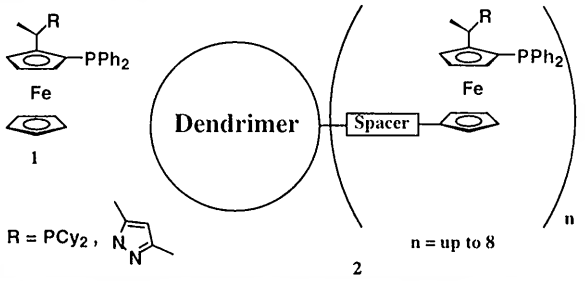
Dendrimers covered with catalytically active centres on the surface are of interest in terms of recovering expensive catalysts [1]. As an interface between heterogeneous and homogeneous catalysis, these catalysts react in a homogeneous solution and might be recycled by virtue of their molecular size (membrane reactor) and their altered solubility.

We report how to bind the ligand system **1** on a dendritic core via ester or amide functions. The synthesis of dendrimers such as **2** with up to 8 diphosphine or phosphine pyrazol units is described. Analytical data und catalytical results in the enantioselective hydrogenation and hydroboration reactions are presented.



[1] a) Knapen, J.W.J.; van der Made, A.W.; de Wilde, J.C.; van Leeuwen, P.W.N.M.; Wijkens, P.; Grove, D.M.; G.van Koten, G. *Nature* **1994**, 372, 659. b) Davies, P.J.; Grove, D.M.; van Koten, G. *Organometallics* **1997**, 16, 802.

Inorganic and Coordination Chemistry **71**

Chiral Pd(II) aryl complexes with bisphosphine and phosphine thioether ligands synthesis and reactivity

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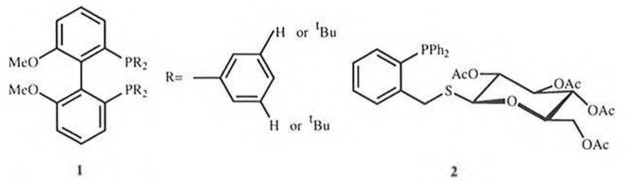
Universitätsstrasse 6, CH-8092 Zürich, Switzerland

Pd (II) aryl complexes are under discussion as intermediates in the Heck reaction and cross coupling reactions [1].

New chiral aryl complexes of the form $PdX(p\text{-}RC_6H_4)(LL)$ and $PdX(C_6F_5)(LL)$ containing the chelating bidentate bisphosphine **1** [2] or the phosphine thioether **2** [3] have been prepared R = OMe, Me, H, COOMe, CN, NO_2, CF_3, X = Br, I.



1 **2**

1 and **2** were used as ligands in asymmetric Pd catalyzed Heck reaction.

The solid state structure of some were solved by x-ray .

We studied their structure and intermolecular dynamics in solution by 2D NMR.

[1] Brown, J. M.; Hii, K. K.; *Angew. Chem.* **1996**, 108, 679

Inorganic and Coordination Chemistry **72**

Chiral complexes of Ru(II), an unexpected P-C bond cleavage reaction in MeO-BIPHEP

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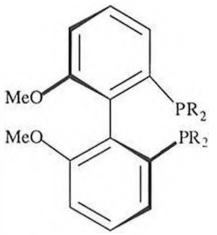
An unexpected P-C bond cleavage has been observed in the chemistry of Ru(II) complexes with MeO-BIPHEP ligands **1**. The reaction of $Ru(OAc)_2$MeO-BIPHEP with 2 equivalents $HBF_4.Et_2O$ in CD_2Cl_2 will be shown to afford an unusual η^6 -arene complex **2**.



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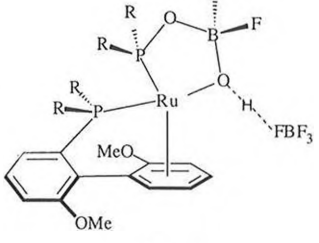


2

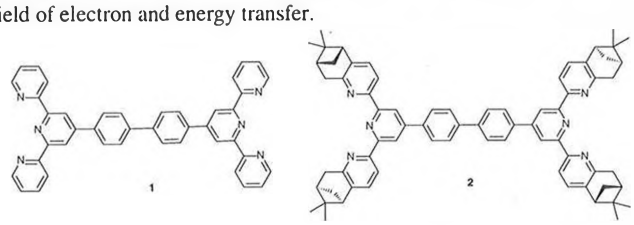
Inorganic Chemistry **73**

Synthesis of Dinuclear Terpyridine Complexes

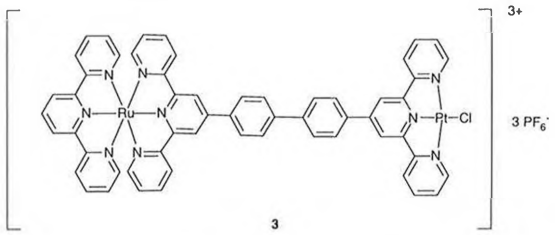
Dominique Suhr, Rachel Chuard, Alexander von Zelewsky

Institute of Inorganic and Analytical Chemistry, University of Fribourg

Dinuclear complexes of terpyridine ligand **1**, involving Osmium (II), Ruthenium (II) and Rhodium (III), have been frequently studied in the field of electron and energy transfer.



We report here the introduction of Platinum (II) to this series of coumpounds. The ligand **1**, bearing two phenyl rings as spacer, is easily prepared in two steps. The synthesis of the ligand **2** is in progress. The Ruthenium is introduced first as the terpyridine derivative, and the final step involves the Platinum complexation on the other side yielding the desired dinuclear complexe **3**.



Inorganic Chemistry **74**

NOVEL CHIRAL PT(II)-COMPLEXES: A STUDY OF THEIR STRUCTURAL FEATURES AND THEIR INTERACTION WITH DNA

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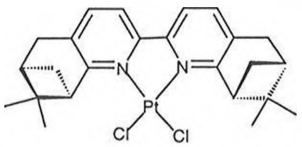
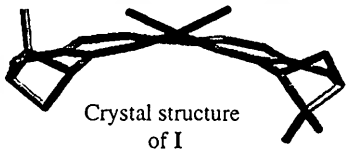
Institute of Inorganic Chemistry
University of Fribourg, Pérolles, CH-1700 Fribourg

We report the preparation of two new chiral bipyridine ligands, starting from α- or β-pinene. Reaction of these ligands with $[PtCl_4]^{2-}$ yields chiral dichloro complexes (e.g. **I**), where the platinum is forced out of the usual square planar form, since these ligands are sterically quite demanding.



I



Several spectroscopic methods, like NMR-, CD- and UV- Spectroscopy as well as X-ray analysis were used for a study of these structural features. Further we report the substitution reactions of the two relatively labile chloride ions with ethylenediamine or diaminocyclohexane. The interaction of these complexes with DNA has been studied by UV/VIS- and CD-Spectroscopy.

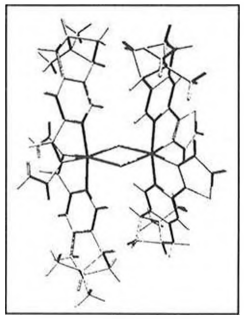
Inorganic Chemistry **75**

Novel Chiral Thienylpyridyl Ligands Complexation Studies

Liana Ghizdavu, Alexander von Zelewsky

Institute of Inorganic and Analytical Chemistry, University of Fribourg, Pérolles; Fribourg, CH-1700, Switzerland

The stereoselective synthesis of the dinuclear, homochiral (ΔΔ) complex $[Rh(th4,5ppy)_2(\mu\text{-}Cl)]_2$ (**I**) represents a superb example of chiral induction. Starting from optically active precursor (-)-myrtenal a chiral didentate ligand 2,2'-thienyl-4,5-(*R,R*)-pinenopyridine [1] has been obtained.



I

Cyclometallation of 2,2'-thienyl-4,5-(*R,R*)-pinenopyridine with Rh(III) gives the ΔΔ$[Rh(th4,5ppy)_2(\mu\text{-}Cl)]_2$ complex with a high stereoselectivity. Upon cleavage of the μ-dichlorobridge with didentate ligands, mononuclear complexes are obtained. This reaction occurs under retention of the configuration (Δ).

The enantiomeric ligand 2,2'-thienyl-4,5-(*S,S*)-pinenopyridine was prepared (derived from (+)-pinene), to complete the study about the ability of these ligands to induce chirality at the metal center. Special attention will be given on the preparation and characterization of this ligand and its Rh(III) complexes.

[1] Gianini, M.; Forster, A.; Haag, P.; von Zelewsky, A.; Stoeckli-Evans, H. *Inorganic Chemistry* **1996**, *35*, 4889-4895.

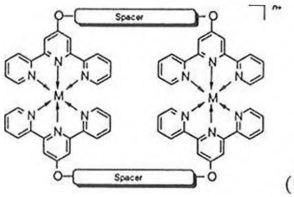
Inorganic Chemistry **76**

Oligopyridine metallo-macrocycles and -dendrimers

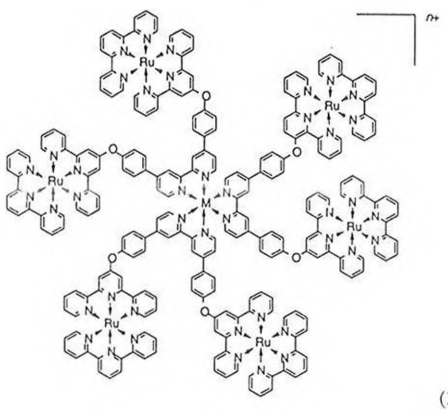
Edwin C. Constable, Catherine E. Housecroft, Chiara Lazzarini and Ingo Poleschak

Laboratory for Supramolecular Chemistry, Institute of Inorganic Chemistry, University of Basel, CH-4056 Basel

Metal-directed self-assembly processes prove to be powerful methods for the construction of novel metallomacrocyclic and metallodendritic systems. The synthesis of suitable oligopyridine precursors will be described as will the convergent assembly of molecules such as (**1**) and (**2**). The merits of divergent and convergent approaches will be discussed.



(**1**)



(**2**)

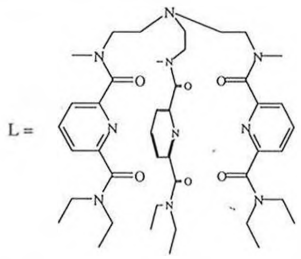
Chimie Minérale et de Coordination **77**

Covalent Tripods Combined with Helically Twisted Unsymmetrical Tridentate Binding Units for Lanthanide Complexation

F. Renaud,[‡] G. Bernardinelli,[‡] J.-C.G. Bünzli,[§] G. Hopfgartner[†] and C. Piguet[‡]

[‡] University of Geneva, Dept of Inorganic Chemistry and Laboratory for X-ray Cristallography, 1211 Geneva 4; [§] University of Lausanne, Chemistry Section, 1015 Lausanne; [†] Pharma Division, Hoffmann-La Roche, 4070 Basel

Semi-rigid unsymmetrical tridentate binding units are promising receptors for the complexation of luminescent nine-coordinate lanthanide metal ions, Ln^{III}, when their facial arrangement is controlled by non-covalent tripods.[1] Improved entropic and enthalpic contributions to the stability of the final complexes are expected from the introduction of covalent tripods designed for the facial helical organization of the three tridentate units around Ln^{III}. However, drastic structural requirements are associated with the bent shapes of semi-rigid tridentate receptors which are fulfilled by ligand L. We present here the synthesis of L together with its reactions with Ln^{III} to give lanthanide podates $[Ln(LH)]^{4+}$. Protonation of the apical nitrogen atom is an essential condition for the structural organization of the complexes *via* the formation of trifurcated hydrogen bonds



[1] C. Edder, C. Piguet, J.-C.G. Bünzli, G. Hopfgartner, *J. Chem. Soc., Dalton Trans.* **1997**, 4657.

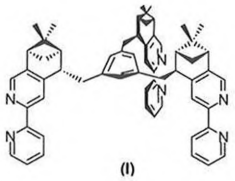
Inorganic and Coordination Chemistry **78**

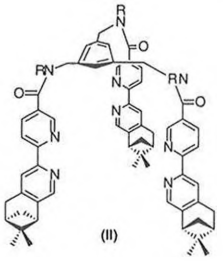
Stereoselective Synthesis of Tripod Ligands and their Chiral Metal Complexes

Ulrich Knof, Manuel Raemy, Alexander von Zelewsky

Institute of Inorganic Chemistry, University of Fribourg, Pérolles, 1700 Fribourg

Stereoselective synthesis is well established in organic chemistry but it is still a challenge in coordination chemistry. The tripodal ligands (**I**,**II**) are designed to fill this gap. Both are build up of CHIRAGEN type bipyridine units linked to a 1,3,5 substituted benzene backbone.





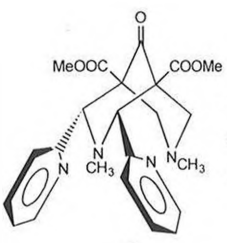
The arrangement of the binding sites is complementary. Whereas (**I**) predominantly forms trinuclear complexes the cavity of (**II**) is preorganised for the formation of mononuclear complexes. Special emphasis will be given on the diastereoselective synthesis of (**I**) and (**II**) and the characterisation of their chiral transition metal complexes.

Anorganische Chemie **79**

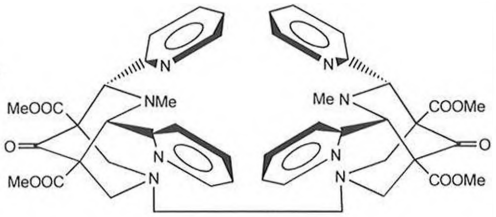
THE FORMATION OF A NEW STABLE $Cu_2^{(II)}$-O_2-SPECIES WITH A BINUCLEATING PREORGANIZED OPEN-CHAINED LIGAND

Heidi Börzel, Peter Comba, Charis Katsichtis

Anorganisch-Chemisches Institut, Universität Heidelberg, INF 270
69120 Heidelberg, Germany
email: boerzel@akcomba.oci.uni-heidelberg.de



L_1



$L_2 = -(CH_2)_2-$
$L_3 = -(CH_2)_3-$
L_4 = m-xylyl

The complexation of $[Cu(CH_3CN)_4]BF_4$ with the bispidone ligand L_1 in CH_3CN, followed by oxygenation at –20°C leads to the formation of the purple μ-1,2-peroxo species $[Cu_2(L_1)_2(O_2)](BF_4)_2$ (**I**), characterized by UV-Vis, IR and Raman-spectroscopy.

The corresponding binucleating ligands L_2 to L_4 lead to dinuclear complexes of the composition of e.g.$[Cu_2L_2](BF_4)_2$. By oxygenation of this species at room temperature, the deep purple complex $[Cu_2L_2(O_2)](BF_4)_2$ (**II**), characterized by UV-Vis, IR and Raman-spectroscopy, is formed.

Molecular Mechanics calculations are used to design the optimum geometry of the spacer group.

Inorganic Chemistry **80**

Reaction of Peroxynitrite with Methionine: Is HOONO* Really Involved?

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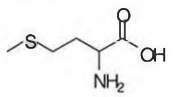
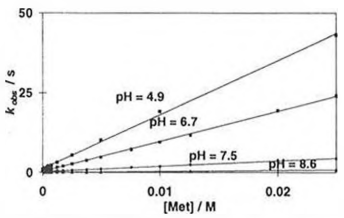
Institute of Inorganic Chemistry, ETH, 8092 Zurich

Peroxynitrite is a strong oxidant, generated by the reaction of $NO^{\bullet}$ with $O_2^{\bullet -}$. It oxidises a wide variety of biomolecules mostly in the acidic form (HOONO). It has been proposed that peroxynitrite decays to NO_3^- via a reactive intermediate (HOONO*). One of the strongest argument in favour of the existence of HOONO* derives from the nonlinearity of the dependence of k_{obs} on [Met] [1]. We decided to reinvestigate this reaction as recent results have shown that HOONO* may not be involved in the decay of peroxynitrite [2].



Kinetic studies were carried out by stopped-flow spectroscopy by following the decay of peroxynitrite at 302 nm. At different pH values (4.9, 6.7, 7.5 and 8.6) with methionine in excess, we found the reaction to be first-order in peroxynitrite and first-order in methionine.



$k(4.9) = 1700\ M^{-1}s^{-1}$
$k(6.7) = 950\ M^{-1}s^{-1}$
$k(7.5) = 170\ M^{-1}s^{-1}$
$k(8.6) = 33\ M^{-1}s^{-1}$

The linear correlation obtained between k_{obs} and [Met] implies that the activated intermediate HOONO* is not required to explain our kinetic data.

[1] Pryor et al., *Proc. Natl. Acad. Sci USA* **1994**, *91*, 11173-11177.
[2] Kissner et al., *Chem. Res. Toxicol.* **1997**, *10*, 1285-1292.

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Inorganic Chemistry **81**

Nitrogen Monoxide Induced Oxidation of Oxyhemoglobin. Kinetic and Mechanistic Studies

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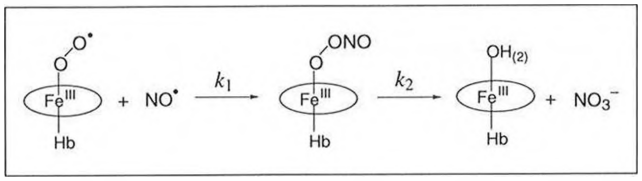
Laboratorium für Anorganische Chemie, ETH-Zentrum, 8092 Zürich

The nitrogen monoxide (NO•) mediated oxidation of oxyhemoglobin (HbO_2) to methemoglobin ($HbFe^{III}$) and NO_3^- is considered to be the major pathway for NO• depletion. It has been proposed that, in analogy to the formation of peroxynitrite ($ONOO^-$) by reaction of NO• with superoxide ($O_2^{\bullet -}$), this oxidation may proceed via a $ONOO^-$ intermediate, free or coordinated to the iron center, which then isomerizes to NO_3^- [1].

In the attempt to identify this intermediate, we have studied by stopped-flow spectroscopy the NO•-mediated oxidation of HbO_2 in the pH range from 7 to 9, as $ONOO^-$ is stable in alkaline solutions. Our results show that at pH ≥ 8 an intermediate is observed. At pH = 9 the bimolecular rate constant for the formation of this intermediate is $k_1 = 10^8\ M^{-1}\ s^{-1}$ for both the α- and β-subunits of HbO_2, whereas for its decay different rate constants were found for the two subunits $k_2 = 40$ and $8\ s^{-1}$.



The UV-vis spectrum of the intermediate species shows an absorption band around 630 nm characteristic for an anion such as acetate or formate bound to the iron(III) center of methemoglobin. The rate of decay is independent on both the NO•- and the HbO_2-concentrations but decreases with increasing pH. The spectroscopic and kinetic data obtained so far suggest that the intermediate species observed can be tentatively assigned as a $HbFe^{III}$(OONO)-complex.

[1] Eich, R. F. et al. *Biochemistry* **1996**, *35*, 6976-6983.

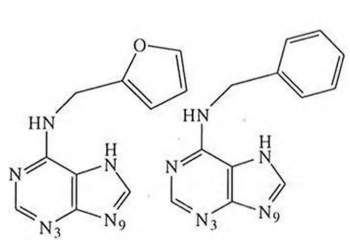
Inorganic and Coordination Chemistry **82**

Copper(II) Complexes of the Purine Derivatives Kinetin and N⁶-Benzyladenine

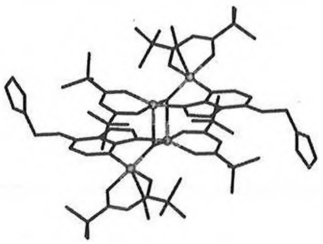
Robert Humbel, Helmut Schmalle, Erich Dubler

Institute of Inorganic Chemistry, University of Zürich, Winterthurerstr. 190, 8057 Zürich

The mechanisms of action of the cytokinin plant growth factors are poorly understood. In a study of the interactions of kinetin and N⁶-benzyladenine with metal ions new copper(II)-complexes have been synthesized and characterized.



Kinetin N⁶-Benzyladenine



(2)

In the dimeric complex $[Cu_2(kinetin^-)_2(kinetin^\circ)_2(H_2O)_2](ClO_4)_2 \cdot 4H_2O$ (**1**) as well as in the tetrameric mixed-ligand complexes of the type $[Cu_4(purine^-)_2(THD^-)_4(OH^-)_2(ROH)_2]$ (**2**) (THD = 2,2,6,6-Tetramethyl-3,5-heptanedione), bridging N(3)/N(9) coordination is found to be the preferred binding mode of the purine unit. The magnetic properties of the compounds have been investigated by EPR and magnetic susceptibility measurements. Strong antiferromagnetic exchange is found in (**1**) whereas weak ferromagnetic interactions occurs in (**2**). ESI-MS and spectroscopic data of (**2**) dissolved in CH_2Cl_2 indicate that the tetrameric structure type of the complexes found in the solid state is still present in solution.

Anorganische/Koordinations-/Chemie **83**

Comparison of the Metal Ion-Binding Properties of Adenosine 5'-Diphosphate (ADP^{3-}) and Guanosine 5'-Diphosphate (GDP^{3-})

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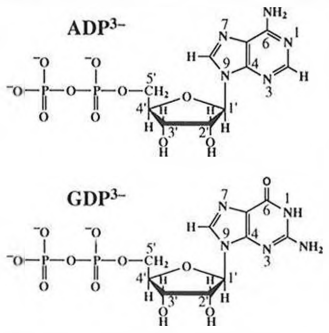
In our attempts to evaluate the metal-ion binding properties of nucleotides [1,2] we have now measured by potentiometric pH titration the stability constants of some metal ion (M^{2+}) complexes of ADP^{3-} and GDP^{3-} (= NDP^{3-}). Comparison of these results, $K^M_{M(NDP)}$, with the expected stabilities, $K^M_{M(NDP)op}$, for a sole phosphate-M^{2+} coordination [3], according to $\log \Delta = \log K^M_{M(NDP)} - \log K^M_{M(NDP)op}$ reveals increased complex stabilities; these are to be attributed [1,2] to the formation of macrochelated species, $M(NDP)^-_{cl}$, in which the phosphate-coordinated M^{2+} interacts also with N7 of the purine residue. The preliminary results are summarized in the Table. From these data it is evident that the extent of macrochelate formation is more pronounced for the $M(GDP)^-$ species; this is most probably due to the larger basicity [1] of N7 in the guanine compared to that in the adenine residue.



M^{2+}	$M(ADP)^-$		$M(GDP)^-$	
	$\log \Delta$	$\%M(ADP)^-_{cl}$	$\log \Delta$	$\%M(GDP)^-_{cl}$
Mg^{2+}	0.06 ± 0.04	13 ± 9	0.10 ± 0.05	21 ± 10
Zn^{2+}	0.13 ± 0.04	26 ± 7	0.43 ± 0.05	63 ± 4
Cd^{2+}	0.32 ± 0.06	52 ± 6	0.61 ± 0.06	75 ± 3

Supported by the Swiss National Science Foundation.

[1] H. Sigel, *Chem. Soc. Reviews 22* (1993) 255-267.
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[3] S. A. A. Sajadi, B. Song, and H. Sigel, submitted for publication.

Anorganische/Koordinations-/Chemie **84**

Solvent Influence on the Extent of Chelate Formation in Complexes of Acetonylphosphonate (AnP^{2-}), an Analogue of Acetyl Phosphate (AcP^{2-})

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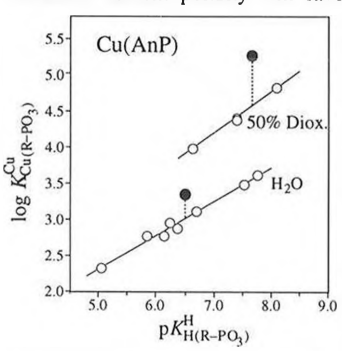
AcP^{2-}, $CH_3C(O)OPO_3^{2-}$, is involved in many phosphorylation processes occurring in biology. Since these reactions also depend on the presence of metal ions (M^{2+}), we have recently determined [1] the stabilities of various M(AcP) complexes and we could demonstrate that 6-membered chelates involving the carbonyl O atom are in equilibrium with isomeric species in which M^{2+} is only -PO_3^{2-}-coordinated! With the aim to prove that a reduced solvent polarity will favor the pertinent chelate formation, we studied the influence of increasing amounts of 1,4-dioxane on the stability of M(AnP) complexes; AnP^{2-}, $CH_3C(O)CH_2PO_3^{2-}$, was used for these studies because it is not hydrolysis-sensitive in contrast to AcP^{2-} itself. From the Figure it is evident that Cu(AnP) (●) is more stable than expected on the basis of the basicity of simple (○) phosph(on)ate ligands ($R\text{-}PO_3^{2-}$). Results as shown in the Figure were obtained via potentiometric pH titrations and they allow to calculate [2] the formation degree of the chelated or closed (cl) species. For $Cu(AnP)_{cl}$ the formation degree increases from 56 ± 7 to 69 ± 3 and 80 ± 2% by changing the solvent from water to water containing 30 or 50% (v/v) 1,4-dioxane, respectively. Hence, one has to conclude that the low polarity present in active-site cavities of enzymes [3] favors the participation of the carbonyl oxygen in metal ion interactions.



Supported by the Swiss National Science Foundation.

[1] H. Sigel, C. P. Da Costa, B. Song, and F. Gregáň, submitted for publ.
[2] H. Sigel and B. Song, *Met. Ions Biol. Syst. 32* (1996) 135-205.
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Anorganische/Koordinations-/Chemie **85**

Effect of (N3)-bound Metal Ions on the Deprotonation of the (N1)H Site in Complexes of Benzimidazole Derivatives

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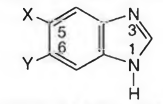
In previous work [1] we used 5(6)-nitrobenzimidazole (NBI) as a ligand with a low pK^H_{HL} for establishing the correlation between complex stability (log K^M_{ML}) and ligand basicity (pK^H_{HL}) for (benz)imidazole-type ligands. Now we included 5,6-dinitrobenzimidazole (DNBI) and studied its proton- and M^{2+}-binding properties *via* potentiometric pH titrations. Among others [2], the following equilibria were considered: $L \rightleftharpoons (L–H)^- + H^+$ (K^H_L) and $M^{2+} + (L–H)^- \rightleftharpoons M(L–H)^+$ ($K^M_{M(L–H)}$). The preliminary results for both ligands are listed in the Table (columns 2 and 3). By using these data it is possible to quantify the effect of the (N3)-bound metal ion on the deprotonation of the (N1)H site: $pK^H_{ML} = pK^H_L + \log K^M_{ML} - \log K^M_{M(L–H)}$ (Table; column 4). It is evident that the acidification is rather pronounced; the (N1)H acidity increases ($\Delta\, pK_{ML} = pK^H_L - pK^H_{ML}$) and depends somewhat on the M^{2+} considered (column 5). The results indicate that the two nitrobenzimidazole ligands behave similar.



NBI: X = NO_2; Y = H

DNBI: X = Y = NO_2

M^{2+}	$\log K^M_{ML}$	$\log K^M_{M(L–H)}$	pK^H_{ML}	$\Delta\, pK_{ML}$
	L = NBI:	$pK^H_{H(NBI)} = 3.61 \pm 0.02$		$pK^H_{NBI} = 10.58 \pm 0.03$
Mn^{2+}	0.37 ± 0.06	2.22 ± 0.10	8.73 ± 0.12	−1.85 ± 0.12
Co^{2+}	1.25 ± 0.02	3.67 ± 0.13	8.16 ± 0.13	−2.42 ± 0.13
Ni^{2+}	1.63 ± 0.05	4.1 ± 0.3	8.1 ± 0.3	−2.5 ± 0.3
	L = DNBI:	$pK^H_{H(DNBI)} = 1.72 \pm 0.06$		$pK^H_{DNBI} = 8.92 \pm 0.03$
Mn^{2+}	0.08 ± 0.05*	1.85 ± 0.04	7.15 ± 0.07	−1.77 ± 0.08
Co^{2+}	0.84 ± 0.07	2.73 ± 0.06	7.03 ± 0.10	−1.89 ± 0.10
Ni^{2+}	1.23 ± 0.10	3.38 ± 0.14	6.77 ± 0.17	−2.15 ± 0.17
*Estimated value		I = 0.5 M, $NaNO_3$; 25°C		Error limits: 3 σ

Supported by the Swiss National Science Foundation, the Swiss Federal Office for Education & Science (COST D8), and the 'Novartis Foundation, formerly Ciba-Geigy-Jubilee Foundation'.

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[2] L. E. Kapinos, B. Song, and H. Sigel, *Inorg. Chim. Acta* (M. E. Vol'pin Memorial Issue) (1998) in press.

Inorganic Chemistry **86**

Reaction of Peroxynitrite with Ascorbic Acid

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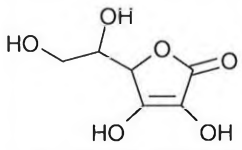
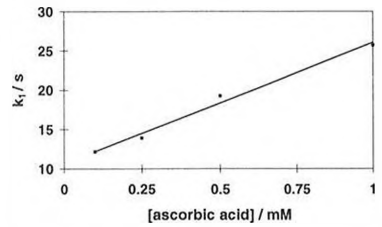
Peroxynitrite is formed *in vivo* by the diffusion-controlled reaction of NO$^\bullet$ with $O_2^{\bullet -}$. The protonated form, ONOOH is a strong oxidant, which reacts with a wide variety of biomolecules. It has been suggested that the decay of ONOOH to NO_3^- proceeds via a reactive intermediate, ONOOH$^\bullet$. The non-linearity of the dependence of k_{obs} on [ascorbic acid] (as well as [methionine]) [1, 2] was construed as evidence for the existence of ONOOH$^\bullet$. A detailed kinetic study of the decay of ONOOH has shown that ONOOH$^\bullet$ may possibly not be involved [3]. We reinvestigated the reaction between ascorbic acid (AA) and ONOOH and found that the reaction is biphasic.



Kinetic studies were carried out by stopped-flow spectroscopy at 350 nm under anaerobic conditions to avoid autoxidation of AA. At pH 6.7 and with AA in excess, the rate constant of the first step (k_1) is linearly dependent on [AA]. The rate of the second step appears not to be dependent on [AA]. These results indicate that the activated intermediate ONOOH$^\bullet$ is superfluous and that further studies are needed to clarify the mechanism of this reaction. The fast first step suggests that ascorbic acid may play an important role in our antioxidant defences.



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[2] Pryor et al., *Arch. Biochem. Biophys.* **1995**, *322*, 53-59

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Inorganic Chemistry **87**

Identifikation of a Ferryl Intermediate in the Reaction of Oxymyoglobin with Peroxynitrite

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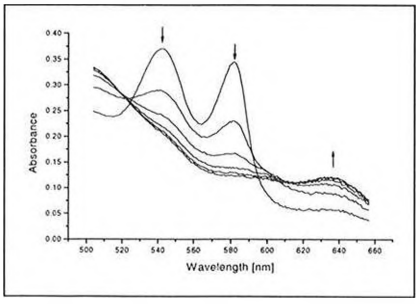
Peroxynitrite ($ONOO^-$) is a strong oxidant with biological relevance as it can be formed *in vivo* from the reaction between NO$^\bullet$ and $O_2^{\bullet -}$. Recently it has been shown that peroxynitrite can diffuse through the erythrocyte membrane and react with oxyhemoglobin (HbO_2) to yield methemoglobin ($HbFe^{III}$) [1].

We have studied the reaction between oxymyoglobin and peroxynitrite by stopped-flow spectroscopy. The absence of a clean isosbestic point in the time-resolved (0-640 ms) absorption spectra indicate that the reaction proceeds via an intermediate. A detailed analysis of the spectra suggests that this intermediate species is ferryl myoglobin ($MbFe^{IV}$=O). To get the rate constants of the two steps of the reaction we followed the absorbance changes at 612 and 589 nm, respectively.



$MbO_2 + HOONO \xrightarrow{k_1} MbFe^{IV}{=}O$ $\quad k_1 = 4\times10^4\ M^{-1}s^{-1}$

$MbFe^{IV}{=}O + HOONO \xrightarrow{k_2} MbFe^{III}$ $\quad k_2 = 2\times10^4\ M^{-1}s^{-1}$ $\quad$ (pH = 6.9)

The rate constants are both linearly dependent on the peroxynitrite concentration and increase with decreasing pH indicating that the acidic form (HOONO) is the reactive species.

[1] Denicola, A.; Souza, J. M.; Radi, R. *Proc. Natl. Acad. Sci. USA*, **1998**, *95*, 3566-3571

Inorganic and coordination chemistry **88**

A Fully Automated pH-NMR Titration Unit For Protonation and Complexation Studies in Solution

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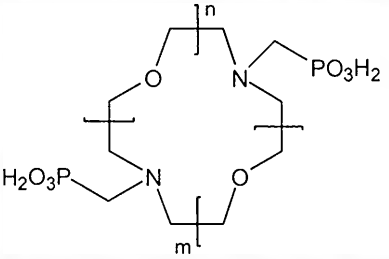
By coupling a NMR spectrometer equipped with a flow-through probe with a pH titrator [1] a fully automated set up was developed, which allows to follow the chemical shifts of the NMR signals as a function of the pH The instrumentation was checked by studies of the protonation and Cd^{2+}, Zn^{2+} and Pb^{2+} complexation equilibria of **1 - 3** following the ^{31}P and ^1H-NMR signals.



1 m = n = 1
2 m = 1, n = 2
3 m = n = 2

Starting from acidic solution the ligand is neutralised by adding small amounts of NaOD in D_2O. After equilibration the solution at each titration point is pumped through the probe and the desired NMR spectra are recorded. A complete titration with ca. 70 points, at which both the ^{31}P- and ^1H-NMR spectra are measured, needs about 20 h. The amount of substance required for such a titration is only 0.05 mmol (10 ml of a 5.10^{-3} M solution).

By fitting the data with the program HYPNMR [2] the equilibrium constants and the chemical shifts for each species have been calculated. The results are excellent and compare well those obtained from potentiometric titrations.

[1] A. Zuberbühler, Th. A. Kaden, *Talanta* **1982**, *29*, 201

[2] C. Frassineti, S. Ghelli, P. Gans, A. Sabatini, M.S. Moruzzi, A. Vacca, *Analytical Biochemistry* **1995**, *231*, 374

Inorganic Chemistry **89**

POTENTIOMETRIC TITRATION OF RUTHENIUM-2,2'-BIPYRIDINE-DIETHYLENTRIAMINE COMPLEX

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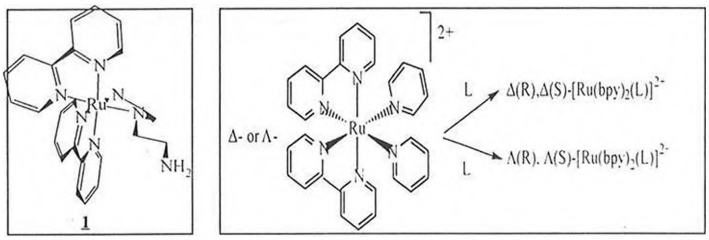
The interaction of aliphatic polyamines with transition metal ions has been an attractive area in coordination chemistry during the last decades. [1] Here we report the synthesis of $Ru(bpy)_2(\mathbf{L})^{2+}$ **1** (**L**= diethylentriamine) and the acid-base behaviour of the non coordinated amine group as a model for the interaction of Linear Polyethylene-Imine (LPEI) with ruthenium(II)-bis-bipyridine complexes. Pairs of **1** (Δ(R) , Δ(S) and Λ(R), Λ(S)) were prepared from enantiomerically pure chiral building blocks[2] Δ- and Λ-$[Ru(bpy)_2(py)_2]^{2+}$. The complexes were characterized by ^{1}H-NMR-, UV-Vis-, CD- spectroscopy, acid-base titration and Mass Spectrometry.



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Inorganic Chemistry **90**

Eine neue Verbindung aus dem Sn – Sr -Phasensystem

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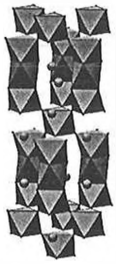
Angeregt durch die Eigenschaft der Verbindung $BaSn_3$ supraleitend zu sein [1], konnte die bisher noch nicht genauer charakterisierte Verbindung $SrSn_3$ synthetisiert und deren Struktur aufgeklärt werden (Tab.1) [2]. Im Gegensatz zum $BaSn_3$ bildet $SrSn_3$ keine durchgehenden, aus Sn-Oktaedern aufgebauten Stränge (Abb.1). Die Veränderung der Stapelfolge wird offensichtlich durch die Kationengrösse beeinflusst. Augenfällig ist die strukturelle Ähnlichkeit zu den hexagonalen Elpasolithen [3].



Raumgruppe:		R $\bar{3}$M (Nr.166), Z=12		
Zellkonstanten: a = 6.9386(4) Å, c = 33.093(2) Å				
Atom	Lage	x	y	z
Sn1	18h	0.3215(1)	0.16073(5)	-0.04194(2)
Sn2	18h	0.0426(1)	0.52130(5)	0.12262(2)
Sr1	6c	0.6667	0.3333	0.20195(5)
Sr2	6c	0.6667	0.3333	0.04398(5)

Tab.1

Abb.1: Ausschnitt aus der Struktur von $SrSn_3$

[1] T. F. Fässler, C. Kronseder, *Angew. Chem.* **1997**, *109*, 2800.
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Inorganic Chemistry **91**

ORGANOMETALLIC COMPOUNDS AS PRECURSORS FOR NEW MATERIALS

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Advanced synthetic procedures in organometallic chemistry allow the controlled design of compounds of a given stoichiometry [1]. Fe, Te ratios of 3:2 and 4:2 occur in $Fe_3Te_2(CO)_9$ (**1**) and the recently synthesized $Fe_4Te_2(CO)_{11}$ (**2**) [2], in contrast to the known binary Fe-Te phases. The thermal decomposition of (**1**) leads to the formation of a new metastable phase "Fe_3Te_2" [3].

We have measured the Fe K-edge EXAFS (*Swiss-Norwegian Beamline* at the *ESRF*, Grenoble) of (**1**) and (**2**) and several samples of the decomposition product "Fe_3Te_2", as well as several model compounds such as $Fe_3Se_2(CO)_9$ and $Fe_{1.1}Te$.

The data analysis shows that *in principal* neighboring Fe/Te or Fe/Se distances can be resolved. The evaluation for "Fe_3Te_2" indicates the presence of shorter Fe-Fe contacts (2.47 Å) than in known iron tellurides (shortest Fe-Fe distances in $Fe_{1.1}Te$ are 2.70 Å).

[1] M.L. Steigerwald; *Polyhedron* **1994**, *13*, 1245 (and references therein).
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Anorganische-Koordinationschemie **92**

Li_5AlSi_2: eine neue Zintlphase mit einem $[AlSi_{4/2}]^{5-}$ Gerüst

Simone Zürcher, Michael Wörle und Reinhard Nesper
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Im System Li/Al/Si waren bis jetzt nur zwei Phasen bekannt: LiAlSi und $Li_{12}Al_3Si_4$. Eine neue Zintlphase:Li_5AlSi_2 wurde hergestellt.

Der Kristall wurde mit Hilfe von Synchrotron-Strahlung am DESY in Hamburg (HASYLAB-Synchrotron) gemessen.

Die Phase kristallisiert in der tetragonale Raumgruppe I –42d mit folgenden Zellkonstanten: a = 617.0 pm, c = 1219.3 pm.
In der Struktur (Abb. 1) ist ein $AlSi_{4/2}$-Gerüst vorhanden, der dem $SiO_{4/2}$-Gerüst von Crystobalit entspricht. Das Zintl-Klemm Konzept wird nach $[Li^+]_5[(Al^-)(Si^{2-})_2]^{5-}$ erfüllt.

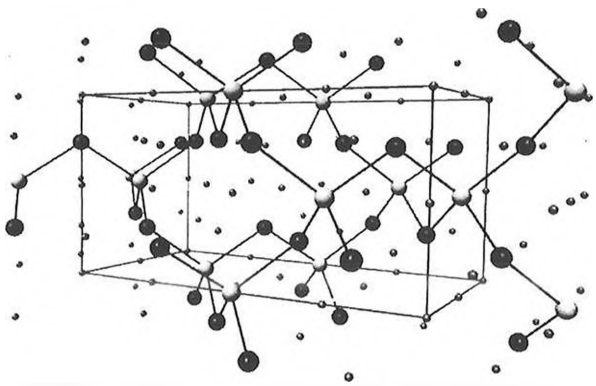

Abbildung 1: Si (gross, schwarz), Al (gross, hell), Li (klein).

Inorganic and Coordination Chemistry **93**

The Electronic Structure of the Zintl Anions in Ba_3Ge_4.

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The Zintl phases are interesting materials because of the almost infinite structural variety of their Zintl anions. The Zintl phase Ba_3Ge_4 [1] crystallises in a new structure type in the orthorhombic space group *Cmmm*. It contains isolated Ge_4^{6-} butterfly anions and butterfly anions that are polymerised to infinite chains $^1_\infty[Ge_4^{6-}]$.

The structure of Ba_3Ge_4 is one of the few example of a polymerisation in the solid state. One of the most interesting characteristic of this structure is the presence of a reversible polymerisation in a single crystal, i.e. the polymer and the isolated monomers coexist in the same crystal. It is also one of the few example of bond length isomerisation in the solid state. The electron localisation function (ELF) [2,3] is used to investigate the bonding structure of the Zintl anions contained in Ba_3Ge_4. For a better understanding of the bonding structure near the Fermi level, the use of the partial electron density (PED) is shown here. Of particular interest is the understanding of the intramolecular and intermolecular bond of the isolated and polymerised butterfly anions, respectively.

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[3] A. Savin, T.F. Fässler; *Chemie in unserer Zeit*; **3**; 110 (1997)

Inorganic and Coordination Chemistry **94**

Diffuse Scattering of the Lithium Boride Li_xB

Michel Wörle, Reinhard Nesper,
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The lithium boride with the composition Li_xB ($0.667 < x < 1.22$) contains linear boron chains embedded and stabilized in a lithium matrix. A simultaneous Rietveld refinement of Xray and neutron diffraction powder data revealed, that the chains are disordered along the chain direction, giving rise to areas of diffuse intensity in the corresponding powder diffraction patterns. The average boron-boron distance is not commensurate with the lithium matrix. The diffuse intensity in this system was simulated and the bonding situation in the boron chains was investigated by means of theoretical and spectroscopical methods.

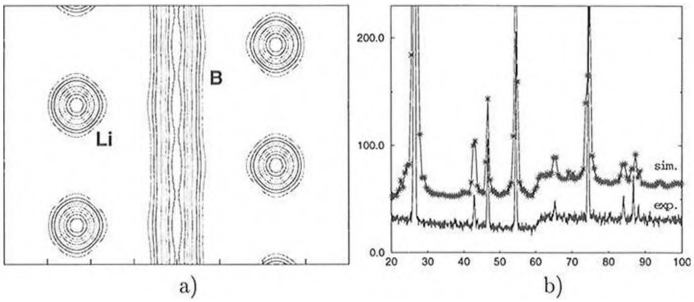

Figure 1: a) Electron density distribution in Li_xB and b) experimental and simulated neutron powder diffraction pattern with diffuse scattering.

Anorganische/Koordinationschemie **95**

The Reactor CAIRO — A Versatile Tool to Investigate High-Temperature Reactions

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High-Temperature Solar Technology
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To investigate the high-temperature chemistry of transition metal oxides, such as Fe_3O_4 or Mn_3O_4, the powder cloud reactor CAIRO was developed. Dominant feature of this reactor system is a direct energy transfer to the metal oxide by interfacing metal oxides particles suspended in a carrier gas to concentrated solar radiation. As a result reaction temperatures up to 2300 K can be achieved within a few milliseconds.

The metal oxide/gas suspension is fed continuously into the tubular reactor, flows through a preheating zone (T = 1273 K) and enters the reaction zone, where the chemical reaction driven by highly concentrated solar radiation takes place. Immediately after the high-temperature zone the suspension is quenched and the solid products are collected. Experiments can be conducted under various gas atmospheres.

Employing this reactor the influence of the oxygen partial pressure and of the chemical composition on the thermal reduction of spinel-type metal oxides could be identified (Eq. 1). The results of this study will be presented and discussed.

$$(Fe_{1-x}Me_x)_3O_4 \rightarrow \frac{3}{1-y}(Fe_{1-x}Me_x)_{1-y}O + \frac{1-4y}{2(1-y)}O_2 \qquad (1)$$

The application of CAIRO is not limited to investigations on metal oxide reductions. The residence time/temperature range which is otherwise difficult to access offers unique opportunities, e.g., for studying the preparation of intermediates for manufacturing refractories or for characterizing the chemical stability of high performance ceramics.

Anorganische Chemie und Koordinationschemie **96**

Umwelteinflüsse auf Zink - Aktueller Wissensstand der Korrosionsforschung

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Seit mehreren Jahren werden in einem Forschungsprojekt an diversen freibewitterten Standorten in der Schweiz unterschiedliche metallische Werkstoffe ausgelagert. Aus den Ergebnissen der statistischen Auswertung dieser Freibewitterungsresultate konnte für Zink (und weitere Werkstoffe) die korrosionsrelevanten Klimaparameter ermittelt und eine Dosis - Wirkungsfunktion für das Korrosionsverhalten abgeleitet werden.

$Korrosionsgeschwindigkeit_{Zink} = f([SO_2], Nasszeit, Windgeschwindigkeit)$

Zusätzlich wurden aus Massenbilanzen und der Art der gebildeten Korrosionsprodukte die Menge an Metalleintrag in die Umwelt durch Abplatzen oder Abwaschen von Korrosionsprodukten ermittelt.

In den letzten drei Jahrzehnten hat sich der Schwefeldioxidgehalt der Luft in der Schweiz um 60 bis 70 % reduziert, insbesondere aufgrund der Reduktion des Schwefelgehaltes im Heizöl. Die Auswirkungen dieser markanten Verbesserung der Luftqualität auf die Lebensdauer von Zink und verzinkten Werkstoffen sowie auf die Menge an Zink, welche infolge der Korrosion in die Umwelt gelangt, lassen sich aus den Resultaten des Projektes ableiten. Damit wird eine wirkungsorientierte Beurteilung der Luftreinhaltemassnahmen aus werkstofftechnischer Sicht möglich.

Inorganic Chemistry **97**

Synthesis and Characterization of Mesoporous MnO_x-SiO_2 Aerogels for the Selective Catalytic Oxidation of Ammonia

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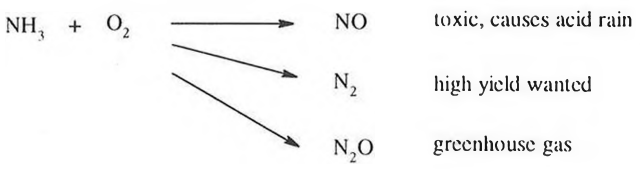
Catalytic activity and selectivity of mixed oxide catalysts are strongly influenced by the dispersion of the acitve metal center. The sol-gel process of metal alkoxides in alcoholic medium is an efficient method for producing homogeneously distributed mixed oxides with controlled mesoporous networks [1,2].

The selective oxidation of ammonia is relevant in the treatment of exhaust gases, where the emission of the NH_3 used in the selective catalytic reduction of NO_x has to be avoided. For that purpose the emitting NH_3 reactant is catalytically oxdized to N_2 and water.

Here we report the synthesis of mesoporous binary silica-manganese oxide aerogels. The aerogels were characterized by means of TPR, ammonia adsorption, vibrational and UV/Vis-spectroscopy, XPS and TEM and were tested for the selective catalytic oxidation of ammonia. High dispersion of the constituents was found to be a crucial requirement for the high efficiency of silica-manganese mixed oxides.



[1] M. Schneider and A. Baiker, Catal. Rev.-Sci. Eng., 37 (1995) 515.
[2] D.C.M. Dutoit, M. Schneider, P. Fabrizioli, and A. Baiker, Chem. Mater., 8 (1996) 734.

Inorganic Chemistry **98**

Chemical, Structural, and Catalytic Characteristics of Al-MCM-41 prepared by pH-controlled Synthesis

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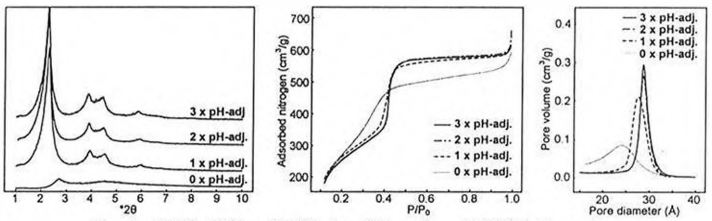
A series of Al-MCM-41 samples was synthesised by repeatedly adjusting the pH of the synthesis gel using various acids [1]. The untreated parent Al-MCM-41 was compared by means of powder-XRD, nitrogen adsorption and elemental analysis with samples that underwent intermediate pH adjustments in intervals of 24 h. The catalytic activity of the different MCM samples was determined for Friedel-Crafts acylation of 2-methoxy-naphthalene.

As a consequence of the pH adjustment, the chemical composition and the yield of Al-MCM-41 changed dramatically. Both the Si/Al ratio as well as the yield increased by a factor of about 2. From powder XRD patterns and nitrogen adsorption data we concluded that the adjustment of the pH stabilises the mesoporous structure and leads to a narrower distribution of pore diameters. The catalytic activity increased by a factor of 2 after the first adjustment of the pH. Repeated adjustments, however, did not show any further significant effect.



Powder-XRD, BET, and BJH plot of the various Al-MCM-41 samples

[1] Ryoo & Kim, *J. Chem. Soc., Chem. Commun.* **1995**, 711

Inorganic Chemistry **99**

Dealumination of mordenite with nitric and oxalic acid

Roberto Giudici and Roel Prins

Laboratory for Tecnical Chemistry, ETH-Zentrum, CH-8092 Zürich

A novel field of application of zeolites could be the adsorption of volatile organic compounds (VOC) currently adsorbed over active charcoal. One advantage, beside the fact that they are not combustible and temperature resistant up to 1000°C, is that their hydrophobicity can be tuned by varying the aluminium content: the higher the Si/Al ratio the more hydrophobic the zeolite. To achieve a low aluminium content, mordenite must be dealuminated by a post-synthesis treatment.

The aim of this work is to compare the dealumination behaviour using two different acids: nitric acid, a mineral acid, and oxalic acid, an organic acid.

After dealumination with the aforementioned acid at reflux temperature, the obtained mordenite samples were then calcined and characterised: the crystallinity was checked by powder X-ray diffraction spectrometry, the bulk Si/Al ratio measured using atomic absorption spectrometry and the textural properties determined by nitrogen adsorption. Some samples were then characterised by solid state NMR (^{27}Al, ^{29}Si, ^{1}H MAS NMR).

Despite the severity of the treatment none of the samples showed an appreciable loss of crystallinity, as confirmed by XRD. The bulk composition showed that both acids were very effective in removing aluminium, although oxalic acid acted faster even at lower concentration. From the nitrogen adsorption data we could detect the formation of a secondary pore system in the zeolite when using nitric acid; with oxalic acid, on the other hand, the overall structure was retained. NMR analysis revealed that with nitric acid an almost extra framework aluminium free mordenite was obtained, whereas with oxalic acid half of the aluminium was still octahedrally coordinated. Moreover, the treatment with oxalic acid led to the formation of a larger number of defects.

Anorganische/Koordinationschemie **100**

A Study on the Reactivity of Alkali Hydroxides With Manganese Oxides and Iron Oxides Under Inert Atmospheres

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High-Temperature Solar Technology
Paul Scherrer Institute, CH-5232 Villigen PSI

The reaction of alkali hydroxides with transition metal oxides is often used for synthesizing complex oxides. However, little is known about the ability of such reactions to generate hydrogen (H_2). To assess the potential of such reactions for applications in solar chemistry we investigated the reactivity of alkali hydroxides AOH (A = Li, Na) with manganese oxides and iron oxides, respectively, under inert atmospheres. The course of the reaction was monitored by means of simultaneous thermogravimetric and mass spectrometric measurements. Structural information were obtained by temperature-dependent X-ray powder diffractometry. The measurements confirmed that H_2 is released when alkali hydroxides are reacted with oxides that contain divalent cations, i.e. rock salt type MO and spinel type M_3O_4 (M = Mn, Fe). It further turned out that depending on the transition metal oxide the newly formed H_2 strongly influences the progressing reaction. In mixtures that contained an iron oxide a fraction of it was reduced to metallic iron and multi-component products were obtained. No such side reactions were observed in reactions that included manganese oxide.

As the most promising reaction the conversion of sodium hydroxide (NaOH) with manganese oxide (MnO) was identified:

$$NaOH + MnO \rightarrow NaMnO_2 + {}^1/_2\, H_2 \qquad (1)$$

At temperatures between 800 and 1000 K and under a flow of inert gas the reaction proceeds to completion. Solid α-$NaMnO_2$ and H_2 were identified as the only products. Under static conditions the reaction reaches equilibrium when a H_2 partial pressure of 100 mbar had developed.

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Inorganic and Coordination Chemistry **101**

The Structure of Cyclopolysiloxanes.

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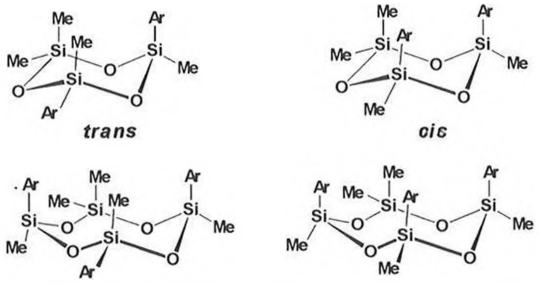
Cyclotri- and cyclotetra-siloxanes are precursors for the formation of siloxane polymers, which are important in the domain of capillary chromatography. Polysiloxanes have received considerable attention in recent years due to their unusual characteristics, such as high thermal and UV stability and their low surface energy. The **cyclotrisiloxane** precursors were obtained by the condensation of a disiloxanediol (A) and a dichlorosilane. In general, when using the racemic form of A the *trans*–isomer of the cyclotrisiloxane will be formed. The reaction of the meso form of A leads to the formation of the *cis*-isomer. **Cyclotetrasiloxanes** where obtained by the condensation of a trisiloxanediol with a dichlorosilane.



Ar = phenyl, 2,6-dimethoxyphenyl or 2,4,6-trimethoxyphenyl

The structures obtained will be compared with those generated by molecular mechanics using certain force field parameters originally produced for zeolites.

Organische Chemie **103**

Aminosäureseitenketten-Nucleobasen-Erkennung in Alanyl-PNA

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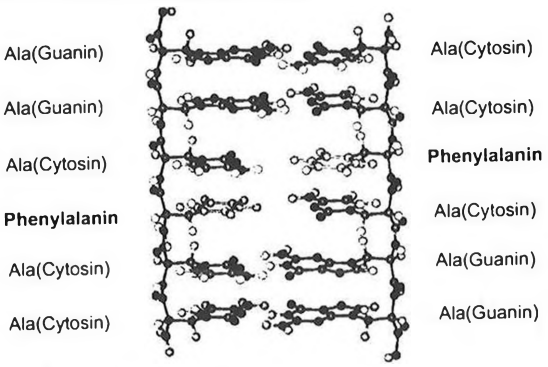
Die linearen Doppelstränge von Alanyl-Peptidnucleinsäuren eignen sich, um den Einfluss struktureller Änderungen auf die Paarungseigenschaften zu analysieren [1]. Außerdem dienen sie als Modell für Intercalation [2] und als Analogon eines DNA-i-Motivs [3]. Die Verwendung von Alanyl-PNA für die Untersuchung der Wechselwirkung von Aminosäureseitenketten mit Nucleobasen im Hinblick auf Wasserstoffbrücken-Erkennung, Stapelung und Solvatation soll vorgestellt werden.



[1] a) U. Diederichsen, *Angew. Chem. Int. Ed. Engl.* **1996**, *35*, 445.
b) U. Diederichsen, *Angew. Chem. Int. Ed. Engl.* **1997**, *36*, 1886.
[2] U. Diederichsen, *Bioorg. Med. Chem. Lett.*, **1997**, *7*, 1743.
[3] U. Diederichsen, *Angew. Chem. Int. Ed.* in press.

Inorganic and Coordination Chemistry **102**

CROSSLINKED POLY(ETHYLENIMIN), A HYDROGEL AND A LIGAND FOR METAL IONS

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Linear Poly(ethylenimin) (LPEI) is a weak polymeric base, which interacts strongly with protons as well as with transition metal ions such as Cd^{2+}, Cu^{2+}, Ni^{2+} and others. The chemical properties of LPEI are similar to small linear amine analogues (UV/VIS spectroscopy, potentiometry,..). The macroscopic physical properties are those of a typical linear polyelectrolyte, soluble up to pH 8, only when partially charged, counterion condensation, pH dependent viscosity, slow diffusion. Cross linking LPEI (around 4-5 % of the nitrogen's), gives one of the rare positively charged Hydrogels. LPEI Hydrogel is strongly swelling in water. The volume increases more than 100 times. The swelling is strongly pH- and solution dependent, therefore it is a typical SMART gel. The swollen Gel is completely transparent and the protonated form shows some ion-exchange capacity. Of special interest is the mobility of solvent and ions in this gel. In this contribution we report the first results of the characterisation of the cross linked LPEI hydrogel and compare these with LPEI, which we have examined extensively by spectroscopy and electrochemistry in the past.

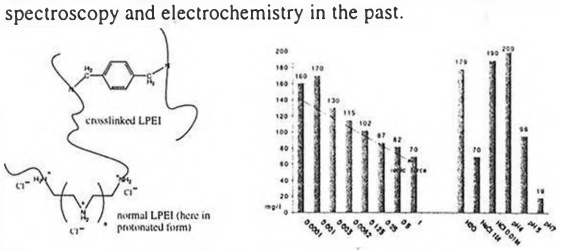

Fig. LPEI structure and Hydrogel swelling behavior

Organic Chemistry **104**

An Efficient Synthesis of Functionalized Oligoribonucleotides

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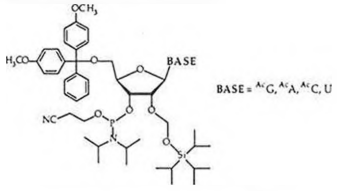
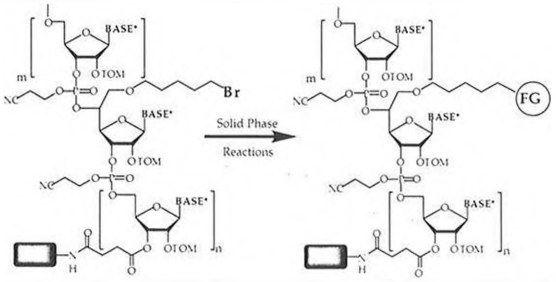
We recently have developed a superior automated RNA-synthesis based on our novel 2'-*O*-(triisopropylsilyl oxymethyl)-protected building blocks (= TOM phosphoramidites, *scheme*). The synthesis displays the following features:

- Coupling efficiency > 99% under standard DNA-coupling conditions.
- Exclusive Formation of 3' → 5' phosphodiester linkages.
- Short and reliable deprotection procedure.



Our reliable RNA-synthesis allowed the efficient assembly of RNA-sequences containing a 6'-O-(bromopentyl)-substituted allofuranosyl nucleotide (*scheme*).



We present examples of solid phase reactions carried out with such RNA substrates and properties of several functionalized oligoribonucleotides obtained by this strategy.

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Organic Chemistry **105**

Thermodynamics of tRNA^{Ala} Acceptor Stem Microhairpin Variants

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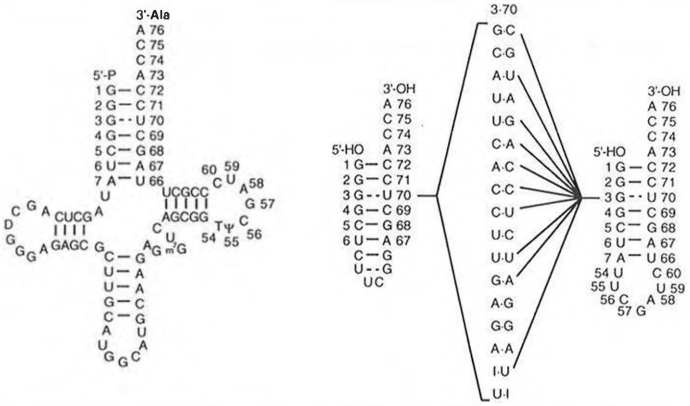
The major determinant for the alanylation of *E. coli* tRNA^{Ala} by its cognate alanine-tRNA-synthetase is a G·U wobble base pair at position 3·70 in the acceptor helix of the tRNA [1]. Since the introduction of heat can simulate the overcoming of the free energy of activation by the enzyme during tRNA molecule binding, we seeked to compare the pairing thermodynamics of the acceptor stem of tRNA^{Ala} with its function *in vivo*. To this end, we undertook a UV absorbance-detected thermal denaturing study of synthetic oligoribonucleotides that correspond to acceptor stem variants of tRNA^{Ala}. We calculated the thermodynamics of base pairing from the melting profiles. The analysis discloses a unique melting behavior and enthalpy-entropy compensation of the G3·U70 variant, but also suggests how the absence of the wild type mispair may be overcome by the enzyme [2].



[1] W.H. McClain, K. Foss, *Science*, **1988**, *240*, 793; Y.-M. Hou, P. Schimmel, *Nature*, **1988**, *333*, 140; K. Musier-Forsyth, N. Usman; S. Scaringe, J. Doundna, R. Green, P. Schimmel, *Science*, **1991**, *253*, 784; K. Gabriel, J. Schneider, W.H. McClain, *Science* **1996**, *271*, 195. [2] P. Strazewski, E. Biala, K. Gabriel, W. H. McClain, in press.

Organische Chemie **106**

Aminoglycoside-Modified Oligodeoxynucleotides: Synthesis and Pairing Properties

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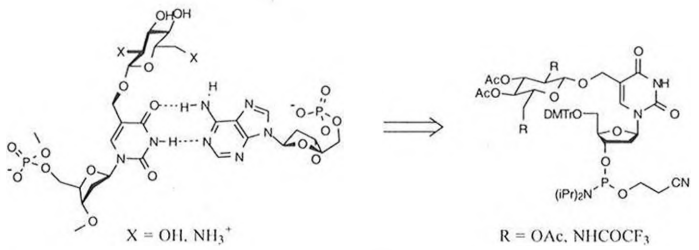
Glycosylated nucleobases are found in the DNA of certain pathogens as counter measure in the ever lasting battle between host and invader. *E. coli* phages of the T-series for instance contain β-D-glucosylated 5-hydroxymethyl-deoxycytidine in their genomic material. A similar modification is found in the genome of *Trypanosoma brucei*. Here, the glucose moiety is linked to 5-hydroxymethyl-deoxyuridine.

We reasoned that simple aminoglycosides, such as 2-amino-2-deoxyglucose and 2,6-diamino-2,6-dideoxy-glucose, conjugated via 5-hydroxyuridine to an oligonucleotide could similarly span across the major groove of oligonucleotide duplexes and thus cover the Hoogsteen face of the base pairs. This novel class of oligonucleotide analogs would allow to study the effects of *charge neutralization* and *replacement of the hydration shell* on duplex stability and conformation.



The corresponding phosphoramidite building blocks are synthesized in 11 steps from uridine and incorporated into oligonucleotides. We will describe the synthesis and pairing properties of such oligonucleotides.

Organic Chemistry **107**

Synthesis and Enzymatic Investigation of Oligonucleotides Containing an Isosteric DNA-Photolesion Analogue

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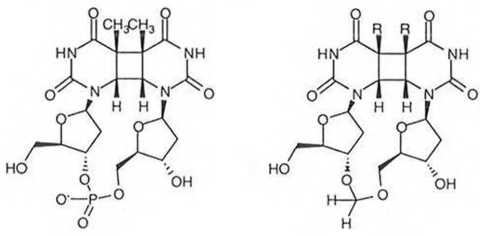
Laboratorium für Organische Chemie, ETH-Zentrum
Universitätsstrasse 16, CH-8092 Zürich, Switzerland

Irradiation of cells with sunlight causes the formation of mutagenic [*cis,syn*]-cyclobutane pyrimidine photodimers such as **1**.

In order to investigate how these photolesions influence the structure and the dynamics of double stranded DNA, we have synthesized oligonucleotides containing **2** as a structural analogue for [*cis, syn*]-cyclobutane pyrimidine photodimers.[1]



1 **2**, R = H, CH_3

The resulting modified oligonucleotides proved to be outstanding substrates for various DNA-photolyases (DNA-repair enzymes). All photolyases studied, including microbial and eucariontic photolyases, were able to repair the DNA photolesion analogue **2**. We therefore conclude, that all photolyases use the same lesion recognition mechanism. The observation, that the central phosphodiester is not required for efficient recognition of the lesion, supports the idea, that photolyases flip their target out of the DNA double helix.

[1] J.Butenandt, A. P. M. Eker, T. Carell, *Chem. Eur. J.* **1998**, *4*, 642-654.

Organic Chemistry **108**

Tricyclo-DNA: Synthesis and Properties of a Nucleic-Acid Analog with a Tricyclic Sugar Moiety

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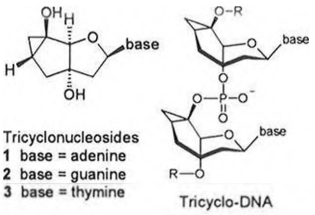
Departement für Chemie und Biochemie der Universität Bern
Freiestr. 3, CH – 3012 Bern

Oligonucleotides and analogs thereof bear the potential to interfere with gene expression by sequence-specific binding to RNA or DNA and are therefore of interest in medicinal chemistry. In the context of studying the effect of conformational restriction of the DNA backbone on the base-pairing behavior, we developed the analog tricyclo-DNA.

We report on the synthesis of the tricylic nucleoside-analogs **1** – **3**. Oligo-(tricyclodeoxynucleotides) were obtained by conventional solid phase oligonucleotide synthesis. 5'-end phosphorylated tricyclo-DNA is chemically stable at temperatures from 0-90 °C and the double-tertiary phosphodiester linkage is stable to hydrolysis by snake-venom phosphodiesterase. Homobasic tricyclo-DNA sequences are extraordinarily stable A–T base pairing systems. The incorporation of tricyclo-nucleosides into DNA sequences can stabilize hairpin loops and DNA triple helices.



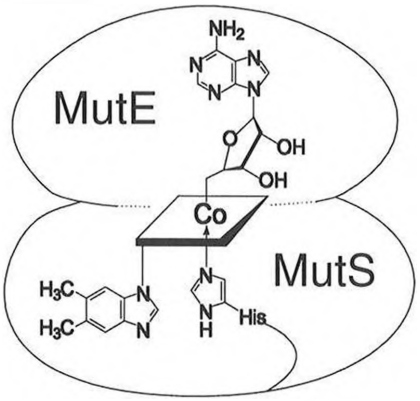
Organic Chemistry **109**

How a protein prepares for B_{12}-binding: structure and dynamics of the B_{12}-binding subunit of glutamate mutase from *Clostridium tetanomorphum*

M. Tollinger[1], R. Konrat[1], B.H. Hilbert[2], E.N.G. Marsh[2], B. Kräutler[1]*

[1]Institute of Organic Chemistry, University of Innsbruck, Austria;
[2]Department of Chemistry, University of Michigan, Ann Arbor, MI, USA.

Glutamate mutase is one of the adenosylcobamide-dependent enzymes and catalyzes the reversible rearrangement of (2S)-glutamate to (2S,3S)-3-methylaspartate. The enzyme from *Clostridium tetanomorphum* comprises two subunits: MutE, which recognizes the upper face of adenosylcobalamin and contains the substrate-binding site, and MutS, a conserved cobalamin-binding domain that interacts with the lower face of the coenzyme [1]. The solution structure and dynamical aspects of MutS were determined from a heteronuclear NMR-study.



[1] E.N.G. Marsh, D.E. Holloway, *FEBS Lett.* **1992**, *310*, 167-170.

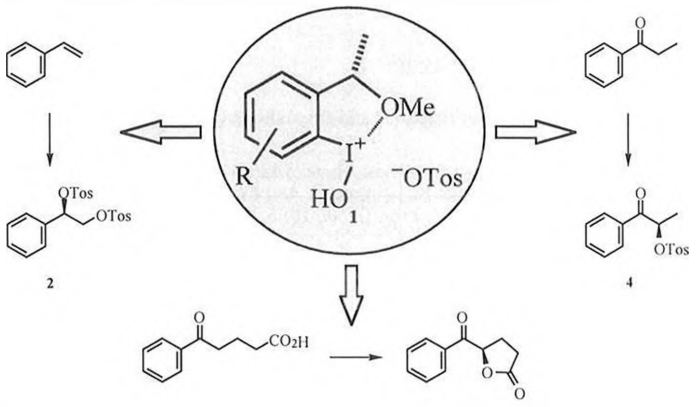
Organic Chemistry **110**

Stereoselective Reactions with Chiral Hypervalent Iodine Compounds

Thomas Wirth*, Urs H. Hirt

Institut für Organische Chemie der Universität Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Hypervalent iodine compounds are extremely versatile oxidizing and oxygenating reagents. The rich chemistry of hypervalent iodine compounds is primarily due to their electrophilic character.
For the use in stereoselective synthesis we developed chiral hypervalent iodine compounds **1**. They are related to the Koser reagent [PhI(OH)OTos] and can be employed in various oxidation reactions. We are reporting the first reactions with these reagents, in which new stereogenic centers are created selectively. The products **2** – **4** can be obtained with good stereoselectivities and can be used as building blocks in further reactions.



T. Wirth, Urs H. Hirt, *Tetrahedron: Asymmetry* **1997**, *8*, 23 – 26.

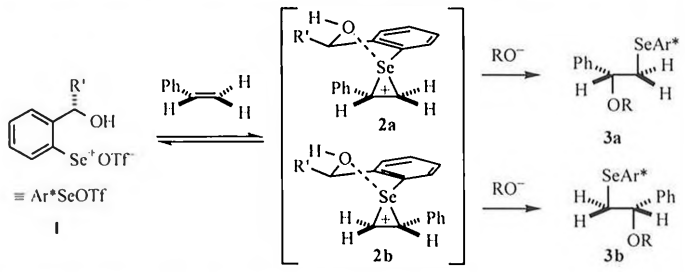
Organic Chemistry **111**

Mechanism of the Stereoselective Alkoxyselenenylation Reaction

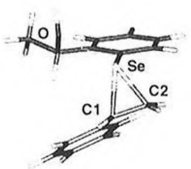
Gianfranco Fragale, Martin Spichty and Thomas Wirth*

Institut für Organische Chemie der Universität Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

We developed a variety of selenium electrophiles of type **1** which can be employed in alkoxyselenenylation reactions with different alkenes (e.g. styrene). In the first step seleniranium ions **2** are formed as intermediates. Subsequent attack by alcohols lead to **3** with selectivities up to 96% *de*.



It could be shown that the formation of these seleniranium ions, which is the stereodeterminant event, is a reversible process. Both seleniranium ions were synthesized independently by a different route and were found to have different stabilities.
Calculations were performed to estimate the relative energies of **2a** and **2b**. The results support the experimental findings.



T. Wirth, G. Fragale, M. Spichty, *J. Am. Chem. Soc.* **1998**, *120*, 3376-3381.

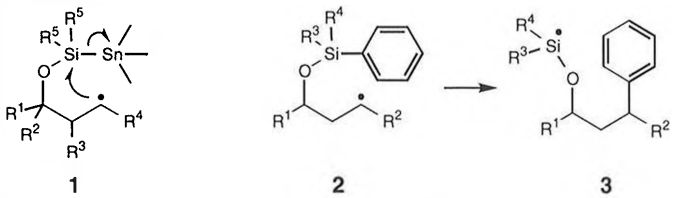
Organic Chemistry **112**

S_Hi Reaction at Silicon – Some Rate Constants and Stereoselective Cyclications

Armido Studer, Martin Bossart and Hanno Steen

Laboratorium für Organische Chemie, Eidgenössische Technische Hochschule, ETH Zentrum, Universitätstrasse 16, 8092-Zürich

We have recently shown that radicals in γ-position to stannylated silyl ethers can undergo a intramolecular homolytic substitution reaction at silicon to form the corresponding cyclic silyl ethers.[1] The tin radical formed upon cyclication propagates the chain (see **1**).



We report some rate constants for the S_Hi-reaction at silicon. Stereoselective cyclications will also be discussed. In addition, an unexpected stereoselective aryl migration from silicon to carbon will be presented (**2** → **3**).

[1] A. Studer, *Angew. Chem.* **1998**, *110*, 507.

Organic Chemistry **113**

B-Alkylcatecholboranes as Source of Radicals

C. Ollivier and P. Renaud

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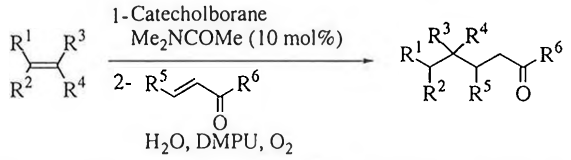
It is known from the pioneer work of Brown [1], that upon treatment with oxygen, trialkylboranes give rise to free radicals. Surprisingly, this method has not been widely applied in synthesis with exception of the system triethylborane-oxygen as initiator for radical reactions [2].
In this communication, we demonstrate that B-alkylcatecholboranes, easily obtained by hydroboration of olefins with commercialy available catecholborane [3], are excellent radical precursors and can be used for highly efficient radical additions to various α,β-unsaturated aldehydes and ketones.



Examples of intramolecular reactions and annulations will be presented.

[1] H.C. Brown, E. Negishi, *J. Am. Chem. Soc.* **1971**, *93*, 3777.
[2] K. Nozaki, K. Oshima, K. Utimoto, *J. Am. Chem. Soc.* **1987**, *109*, 2547.
[3] C.E. Garrett, G.C. Fu, *J. Org. Chem.* **1996**, *61*, 3224.

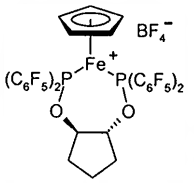
Organic Chemistry **114**

New Iron and Ruthenium Lewis Acids for the Asymmetric Catalysis of the Diels-Alder Reaction

Gérald Bernardinelli, Marion Bruin[a], E. Peter Kündig[a]*, Maria J. Mayor-Lopez[b], Christophe Saudan[a], Eric Thiemermann[a], and Jaques Weber[b]

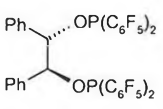
Départements de Chimie Organique[a] et Chimie Physique[b]
Université de Genève, CH-1211 Genève 4, Switzerland

The cationic iron complex **1** [1] is amongst the most effective catalysts for the synthesis of Diels-Alder adducts with quaternary stereocenters [2]. Unlike the boron, titanium and copper based Lewis acid catalysts, the iron complex **1** derives much of its Lewis acid properties from the electron poor, chiral, bidentate phosphorus ligand CYCLOP-F.



1

We here report on our continued investigations in this area. The activity of cationic iron catalysts with different ligand backbones were studied. One of them is the new, readily accessible ligand BIPHOP-F (**2**). Besides its incorporation in the CpFe$^+$ catalyst, we also explored synthetic routes to analogous ruthenium compounds and report here an efficient synthesis of a chiral Ru Lewis acid and on its performance in the DA-reaction. Computational studies (carried out on the iron catalyst **1**) on the conformation of the coordinated enal indicate an s-*trans*-conformation of the enal and an addition of the diene from the top to the coordinated methacrolein.



2

[1] Kündig, E.P., Bourdin, B., Bernardinelli, G., *Angew. Chem. Int. Ed. Engl.*, **1994**, *33*, 1856.
[2] Review: Corey, E.J.; Guzman-Perez, A. *Angew. Chem. Int. Ed. Engl.* **1998**, *37*, 388.

Organic Chemistry **115**

Sakurai or Ene Reaction ?

V. Huber, S. Lauper, T. P. Sieber, M. Alves and T. A. Jenny

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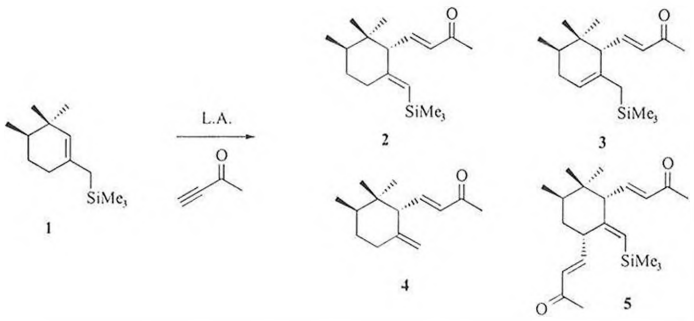
The stereoselective synthesis of (+)-*trans*-γ-irone (**4**) starting from (−)-(5*S*)-tricarbonyl-(2,5,6,6-tetramethylcyclohexa-1,3-diene)iron [1] involves the reaction of (+)-(4*R*)-trimethyl-(3,3,4-trimethylcyclohexenylmethyl)-silane (**1**) with 3-butyn-2-one in the presence of a Lewis acid.

In the case of ZnI_2, products **2**, **3** and **4** are obtained in a 5:10:2 ratio [2]. Use of BF_3 etherate, however, leads to **5** as the main product.



1 **2** **3** **4** **5**

We therefore conclude, that the formation of the desired Sakurai product **4** arises by an ene-reaction followed by hydrolytic cleavage of silane **2** by trace amounts of water. In competition the Lewis acid isomerizes **2** to **3** which subsequently undergoes a second ene-reaction to yield **5** as a single diastereomer.

[1] T.A. Jenny, L. Ma, *Tetrahedron Lett.* **1991**, *32*, 6101
[2] S. Lauper, thesis, University of Fribourg, **1996**

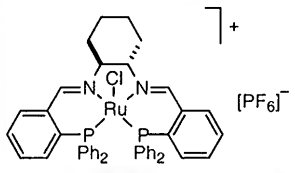
Inorganic and Coordination Chemistry **116**

The Asymmetric Epoxidation of Olefins with H_2O_2 Catalyzed by a Five-coordinate Ruthenium(II) Complex

Robert M. Stoop and Antonio Mezzetti

Laboratorium für Anorganische Chemie, ETH Zürich, CH-8092 Zürich

The five-coordinate ruthenium(II) complex **1**, prepared by reacting its dichloro analogue [$RuCl_2$(PNNP)] [1] with $TlPF_6$, catalyzes the asymmetric epoxidation of unfunctionalized olefins with a variety of primary oxidants. Hydrogen peroxide, a cheap and "clean" oxidant, gives the best results in terms of chemo- and enantioselectivity.



(*S,S*)-**1**

Styrene is epoxidized (35% conversion) in the presence of **1** (1 mol %) with high epoxide selectivity (81%) and enantiomeric excess up to 43%. The remaining products are benzaldehyde (9%) and polystyrene (10%)

To the best of our knowledge, this is the first enantioselective epoxidation with hydrogen peroxide catalyzed by a ruthenium complex. We are investigating other substrates, as well as the influence of various parameters including pH, temperature, and solvent.

[1] Gao, J-X; Ikariya, T; Noyori, R. *Organometallics* **1996**, *15*, 1087.

Organic Chemistry **117**

Use of Glycosyl-Transferases for the Synthesis of Non-Natural Oligosaccharides

G. Baisch, R. Öhrlein

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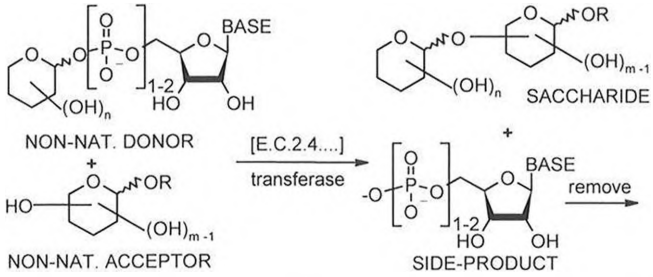
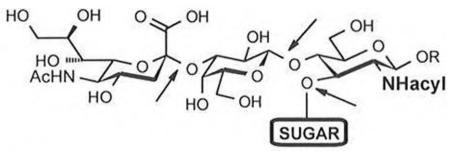
Principle: Glycosyl-transferases are a class of enzymes which transfer a monosaccharide unit from nucleotide-activated donors regio- and stereo-specifically onto an acceptor substrate to produce an oligosaccharide chain.



We used various natural and recombinant transferases to synthesize libraries of pharmacologically relevant oligosaccharides e.g. sialy-Lewis^x, sialyl-Lewis^a or linear-B trisaccharide.



e.g: sialyl-Lewis^x

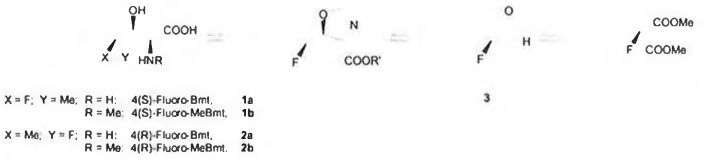
Organic Chemistry **118**

Stereoselective synthesis of 4-Fluoro-Bmt, a fluorinated analogue of the unusual amino acid found in cyclosporin

Ph. Janser

Novartis Pharma AG, Postfach, 4002 Basel

The unusual C9 amino acid butenyl-methyl-threonine, Bmt, is found in the immunosuppressive undecapeptide cyclosporin A. After the first synthesis by Wenger in 1983 [1], Bmt, with it's unique side chain, has drawn the attention of many research groups. Here, we wish to report the synthesis of the fluorinated analogues 4(S)- and 4(R)-Fluoro-Bmt, **1a** and **2a**, and it's N-methylated derivatives **1b** and **2b**.



For the setup of the stereocenters, two different strategies were followed. An enzymatic saponification using the lipase *Candida Cylindraceae* was applied to obtain both antipodes of the key aldehyde **3**. The α- and β-carbon centers were built-up following Togni's protocol [2] of the stereoselective, gold(I)-catalyzed aldol reaction, using the (R,S)-ferrocenylamine ligand originally developed by Hayashi and coworkers [3].

[1] Wenger, R. M. *Helv. Chim. Acta* **1983**, *66*, 2308.
[2] Togni, A.; Pastor, S. D.; Rihs, G. *Helv. Chim. Acta* **1989**, *72*, 1471.
[3] Ito, Y.; Sawamura, M.; Hayashi, T. *J. Am. Chem. Soc.* **1986**, *108*, 6405.

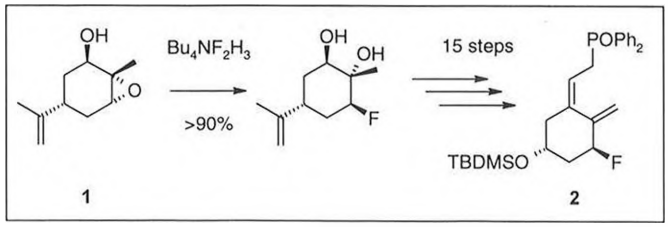
Organic Chemistry **119**

Tetrabutylammonium Dihydrogen Trifluoride in 1-α-Fluoro-25-Hydroxy-Vitamin D_3 Chemistry

Pierre Barbier, Peter Mohr , Marc Muller, and Raffaello Masciadri

F. Hoffmann-La Roche Ltd., Pharma Research Preclinical, Infectious Diseases, CH-4070 Basel, Switzerland

In the course of a medicinal chemistry program aimed at the discovery of new orally active antipsoriatics, the known, but hardly accessible building block **2** was prepared by a new route in gram amounts from (S)-(+)-carvone in 20 steps and 0.6% overall yield. Fluorine was introduced at an early stage by the completely regio- and stereoselective *trans*-diaxial opening of key-epoxide **1** with neat tetrabutylammonium dihydrogentrifluoride at 95°C. Particular attention will be given to aspects of reactivity and stability of intermediates. The technical feasibility of the multistep process was assured by the implementation of sample size adapted BIOTAGE high-speed chromatography.



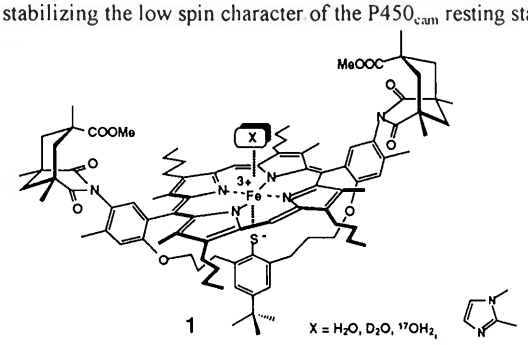
Organic Chemistry **120**

The Origin of the Low Spin Character of the Resting State of $P450_{cam}$ - Conclusions from Experiments with Enzyme Models.

H. Aissaoui[a], R. Bachmann[b], A. Schweiger[b] and W.-D. Woggon[a]

[a] Institut für Organische Chemie der Universität Basel, St.Johanns-Ring 19, CH-4056 Basel
[b] Laboratorium für Physikalische Chemie, ETH-Zentrum CH-8092 Zürich

Cytochrome $P450_{cam}$ catalyzes the hydroxylation of camphor in the 5-*exo* position. The resting state of $P450_{cam}$ is a low spin iron(III)porphyrin having a water and a thiolate coordinating to the iron. The origin of the low spin state of this hexacoordinate iron(III)complex is not understood. To investigate this problem, the enzyme model **1** was synthesized. MS-, EPR- and ENDOR-spectroscopy revealed the coordination of water, and UV-spectroscopy and cyclic voltammetry the coordination of the thiolate ligand. Accordingly **1** is a hexacoordinate high spin iron(III)complex. This is the first experimental proof that coordination of water is not the single determining factor in stabilizing the low spin character of the $P450_{cam}$ resting state.



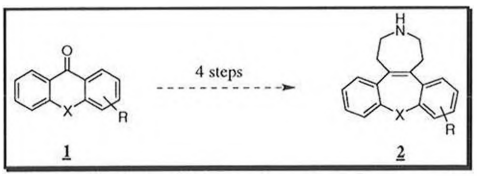
Organic Chemistry **121**

Novel Synthesis of a Tetracyclic Amine Template

R. Mah, H. Rüeger and J. Zergenyi

Novartis Pharma AG, Metabolic and Cardiovascular Diseases, Postfach, CH-4002 Basel, Switzerland

The 3-aza-2,3,4,5-tetrahydro-1H-10-thia-dibenzo[*a*,*d*]heptalene skeleton (**2**, X=S) represents a useful template for broad diversification in a variety of drug discovery programs. A new synthetic route to this interesting structural class employing a Pinacol coupling/rearrangement reaction sequence with readily available thioxanthone derivatives (**1**) has been developed. The previously reported syntheses [1] could thereby be reduced from fifteen to four steps. Synthetic considerations, experimental details and the scope of the synthesis will be presented.



[1] (a) H. Blattner, A. Storni, DE 2723105, **1977**; (b) H. Blattner, A. Storni, EP 30916, **1981**; (c) H. Blattner, A. Storni, US 4707476, **1987**.

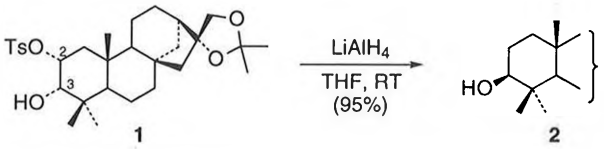
Organische Chemie **122**

Unerwartete Transformationen an tetracyclischen Diterpenen

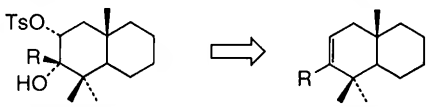
Ralph Müller, Peter Rüedi

Organisch chemisches Institut, Universität Zürich Winterthurerstrasse 190, CH-8057 Zürich, Schweiz

Im Rahmen unserer Arbeiten an Diterpenen des Phyllocladan-Typs wurde die folgende Reaktion des Derivates **1** beobachtet:



Ein identischer Verlauf konnte bei der Modellverbindung **3a** nachgewiesen werden. Unsere bisherigen Experimente zur Klärung des Reaktionsmechanismus lieferten Hinweise auf einen 3,2-Hydridshift. Für eingehende Untersuchungen ist die deuterierte Verbindung **3b** zentral, deren Herstellung aus **4b** in Analogie zu **3a** erfolgt. Das *a priori* einfach erscheinende Vorgehen erfordert jedoch mehrere Reaktionsschritte.



3a R = H
3b R = D

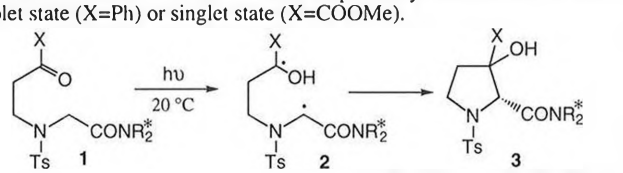
4a R = H
4b R = D

Organic Chemistry **123**

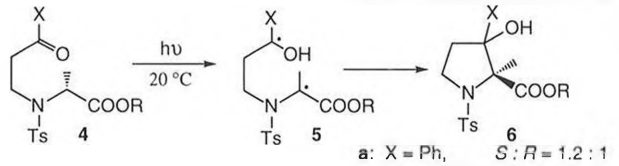
Memory Effect of Chirality - Photocyclization of Amino Acids via Biradicals

Ph. Wettstein, Ch. Stähelin, B. Giese
Department of Chemistry, University of Basel,
St. Johanns-Ring 19, CH-4056 Basel

Depending upon the spin multiplicity of biradicals, a stereoselective C,C-bond formation between radical centers can be accomplished either by asymmetric induction (triplet state) or by a memory effect (singlet state). We have demonstrated this by a Norrish type II cyclization reaction which yields cyclic amino acids **3** and **6** from acyclic amino acids **1** and **4**, respectively. Intermediates are diradicals **2** and **5**, respectively, which exist either in the triplet state (X=Ph) or singlet state (X=COOMe).



a: X = Ph, $R:S > 30:1$
b: X = COOMe, $R:S = 1:1.3$



a: X = Ph, $S:R = 1.2:1$
b: X = COOMe, $S:R = 20:1$

The lifetime of biradical **2a** is long enough so that a chiral auxiliary (NR_2^*) can lead to a steric differentiation of the reaction pathways. Thus, the phenyl ketone **1a** reacts with high asymmetric induction ($R:S$ > 30:1) whereas the keto ester **1b** reacts unselectively. This selectivity pattern changes completely if chiral amino acids **4** are photocyclized. The keto ester **4b** then reacts with high stereoselectivity ($S:R$ = 20:1) which is lost with phenyl ketone **4a**. The chirality of the precursor **4b** is transferred into the product **6b** although the stereogenic center of the amino acid **4b** is destroyed in diradical **5b**. The reasons for this memory effect will be discussed.

Organic Chemistry **124**

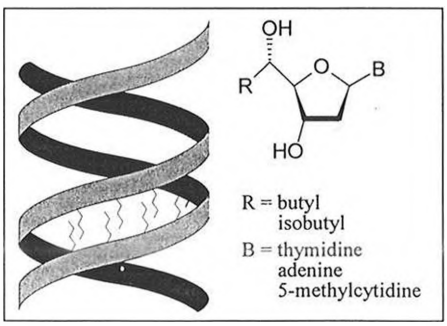
A Synthetic Approach to Investigate DNA Minor Groove Hydration

Huldreich Trafelet and Christian Leumann

Department of Chemistry and Biochemistry, University of Berne, Freiestr. 3, 3012 Bern

DNA-duplex stability and conformation are the result of the interplay between three major factors: 1) hydrogen bonding (AT and GC base pairs), 2) π-stacking of adjacent base pairs and 3) solvation of the polyanionic duplex. From x-ray structures, it is known that water molecules directly hydrogen bonded to the heteroatoms of the bases, the 2'-deoxyribose residues and the phosphate groups are essential in determining the conformation of a DNA duplex. In contrast to this the structural and energetic role of the loosely bound water in the second hydration shell is virtually unknown.

In order to investigate the importance of the hydration of the DNA minor groove we embarked on a project on the synthesis and properties of 5'(S)-alkylnucleoside containing oligodeoxynucleotides. Here we present UV- and CD-spectroscopic data describing the influence of the alkyl chains on DNA-duplex conformation and stability.



Organic Chemistry **125**

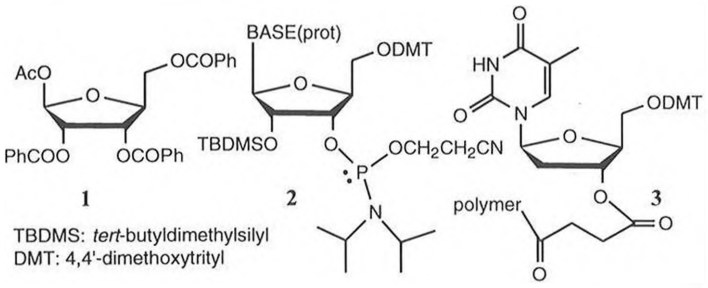
L-Ribonucleosides for Racemic RNA

E. Moyroud and P. Strazewski

Institute of Organic Chemistry, University of Basel,
St. Johanns-Ring 19, CH – 4056 Basel

According to *Wallach*'s rules [1], racemic crystals tend to be more stable and denser than their enantiomeric counterparts. The aim of our work is to test whether the crystallisation of RNA fragments in the racemic form is advantageous for the structure elucidation. Therefore, we anticipate to chemically synthesise L-RNA sequences that will be stoichiometrically mixed with their enantiomers, in order to obtain the required racemates.

Starting from L-xylose, the synthesis of L-ribosyl donor **1** was carried out, followed by the glycosidation of the four protected ribonucleobases according to *Vorbrüggen* [2], and the synthesis of the corresponding fully protected L-phosphoramidites **2**. For the solid support synthesis of 5'-r(GCUUCGGC)T-3' we synthesised from **1** L-thymidine derivative **3** [3] linked to aminomethyl polystyrene.



[1] C. P. Brock, W. B. Schweizer, and J. D. Dunitz, *J. Am. Chem. Soc.* **1991**, *113*, 9811. [2] H. Vorbrüggen, *Acta Biochimica Polonica* **1996**, *43*, 25. [3] M. J. Robins *et al.*, *J. Am. Chem. Soc.* **1983**, *105*, 4059.

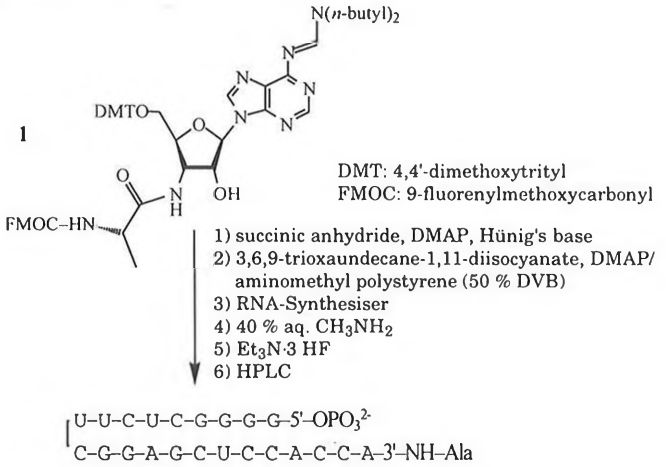
Organic Chemistry **126**

Synthesis of Alanyl-RNA

O. Botta and P. Strazewski

Institute of Organic Chemistry, University of Basel,
St. Johanns-Ring 19, CH – 4056 Basel

This work aims at the synthesis and structure elucidation of 2'/3'-aminoacyl-RNA fragments. One of our target sequences is the aminoacyl acceptor stem of alanyl-tRNA^{Ala}. In order to by-pass chemical lability and isomerisation problems with the adenosine-aminoacylate ester bond during chemical RNA synthesis and in the structure elucidation process of alanyl-RNA, we use an isosteric adenosine analog, 3'-amino-3'-deoxyadenosine. Here, we describe the synthesis of 3'-N-alanylamido-3'-deoxyadenosine derivative **1** starting from adenosine. It serves as an anchor molecule for the synthesis of alanylated oligoribonucleotides on solid support.



Organic Chemistry **127**

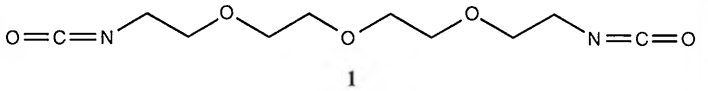
New Spacer for Oligonucleotide Synthesis on Solid Support

S. Gunzenhauser and P. Strazewski

Institute of Organic Chemistry, University of Basel,
St. Johanns-Ring 19, CH – 4056 Basel

The outcome of a successful oligonucleotide synthesis on solid support was shown to be highly dependent on the nature of the support [1] and of the spacer molecule connecting the first nucleoside to it [2]. In our hands, long-chain-alkylamino controlled-pore glass (LCAA-CPG) proved inferior to 50% divinylbenzene-crosslinked aminomethyl polystyrene (AP) mainly in terms of isolated yield of crude RNA oligomer. Steric hindrance at the surface of the solid support is an important factor that influences the loading yield of the first nucleoside, and the average coupling yields for long oligomers. Long spacer molecules ameliorate the efficiency of the reaction between the 2'/3'-nucleosidyl succinate and the solid support, particularly when the nucleoside is sterically crowded near the 2'/3'-hydroxy groups.

We synthesised an alternative to the frequently used hexamethylene diamine spacer that is somewhat longer and conformationally more rigid owing to the partial replacement of methylene groups by oxygen atoms which favorise an all-*gauche* conformation of the spacer chain. The loading protocol of the solid support that we use requires a diisocyanate derivative **1** that is first linked to the nucleosidyl succinate and then to AP [3]. The poster describes the synthesis of **1** from tetraethylene glycol and its use in oligoribonucleotide synthesis.



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[1] C. Collum, A. Andrus, *Tetrahedron Lett.*, **1991**, *32*, 4069. [2] J. Katzhedler *et al.*, *Tetrahedron*, **1989**, *45*, 2777. [3] P. Kumar *et al.*, *Nucleosides & Nucleotides*, **1993**, *12*, 565.

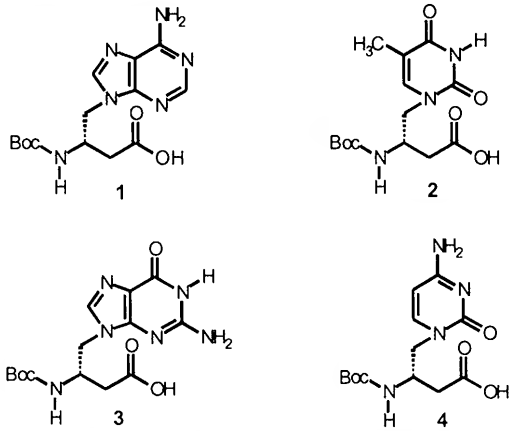
Organische Chemie **128**

β-Homoalanyl PNA: ein Spezialfall der β-Peptide

Harald W. Schmitt, Ulf Diederichsen

Org. Chemie & Biochemie TU München, Lichtenbergstr. 4, 85747 Garching

β-Homoalanyl-Peptidnucleinsäuren zeigen ein strukturimmanentes Potential zur Ausbildung höherer Aggregate [1]. Auch lassen sich gezielt Doppelstränge mit nahezu gestrecktem Rückgrat herstellen [2]. Es soll die Synthese der γ-N9-Adeninyl- (**1**), γ-N1-Thyminyl- (**2**), γ-N9-Guaninyl- (**3**), und γ-N1-Cytosinyl-β-Homoalanyl-PNAs (**4**) sowie deren Oligomerisierung beschrieben werden. Die Basenpaarstabilitäten in der β-Homoalanyl-PNA werden diskutiert.



[1] U. Diederichsen, H. W. Schmitt, *Angew. Chem. Int. Ed.* **1998**, *37*, 302.
[2] U. Diederichsen, H. W. Schmitt, *Eur. J. Org. Chem.* **1998**, 827.

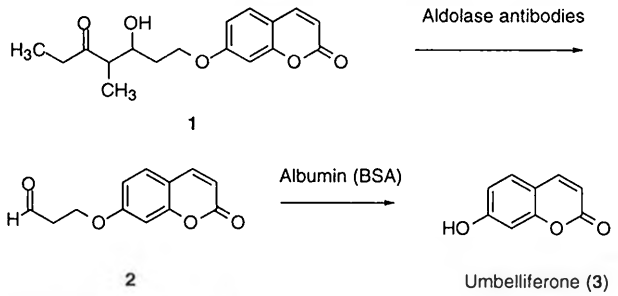
Organic Chemistry **129**

A Stereoselective Fluorimetric Assay for Aldolase Antibodies

Nathalie Jourdain and Jean-Louis Reymond*

Universität Bern, Dept. für Chemie & Biochemie, Freiestr. 3, 3012 Bern

Aldolase antibodies can be prepared by introducing primary amines in antibody binding sites,[1] and their stereoselectivity deduced from retro-aldolization rates of individual aldol stereoisomers.[2] Here we report a simple stereoselective fluorogenic assay for discovering novel aldolase biocatalysts. Retroaldolization of aldol **1** releases aldehyde **2**, which undergoes β-elimination of **3**, a strongly fluorescent product (λ_{em} = 460 ± 20 nm, λ_{exc} = 360 ± 20 nm), in the presence of bovine serum albumin (BSA). The stereoselectivity of aldolase antibodies is determined from reaction with individual stereoisomers of **1**.



[1] a) Reymond, J.-L.; Chen, Y. *Tetrahedron Lett.* **1995**, *36*, 2575; b) Reymond, J.-L.; Chen, Y. *J. Org. Chem.* **1995**, *60*, 6970; c) Wagner, J.; Lerner, R. A.; Barbas, C. F. *Science* **1995**, *270*, 1797.

[2] a) Reymond, J.-L. *Angew. Chem. Int. Ed. Engl.* **1995**, *34*, 2285

Organic Chemistry **130**

An Enantioselective Fluorimetric HTS-Assay for Alcohol Dehydrogenases

Gérard Klein and Jean-Louis Reymond*

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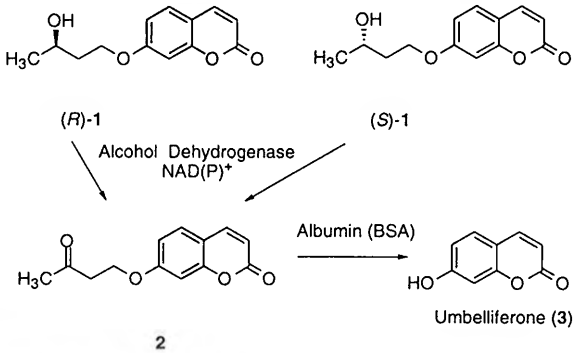
In conjunction with our interest in alcohol dehydrogenase catalytic antibodies,[1] we report a novel high throughput screening (HTS) assay for alcohol dehydrogenases.[2] Thus enzymatic oxidation of (*R*)-**1** and (*S*)-**1** forms ketone **2**, which undergoes β–elimination to **3** under catalysis by bovine serum albuming (BSA),[3] leading to a >20-fold fluorescence increase at λ_{em} = 460 ± 20 nm (λ_{exc} = 360 ± 20 nm). Enantioselectivity is determined in two separate tests with each enantiomeric substrate.



[1] Schröer, J.; Sanner, M.; Reymond, J.-L.; Lerner, R. A. *J. Org. Chem.* **1997**, *62*, 3220.

[2] Klein, G.; Reymond, J.-L. *Bioorg. Med. Chem. Lett.* **1998**, *in press*.

[3] a) Kikuchi, K.; Thorn, S. N.; Hilvert, D. *J. Am. Chem. Soc.* **1996**, *118*, 8184; b) Hollfelder, F.; Kirby, A. J.; Tawfik, D. S. *Nature* **1996**, *383*, 60.

Organic Chemistry **131**

A New Class of Selective α-L-Fucosidase Inhibitors

Adrian Blaser and Jean-Louis Reymond*

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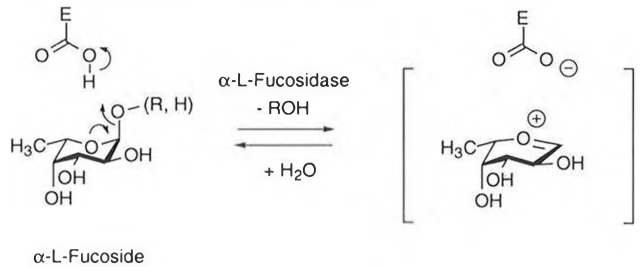
We are interested in developing glycosidase antibodies.[1] Recent work has shown that efficient glycosidase catalytic antibodies can be prepared by immunization against derivatives of known glycosidase inhibitors.[2] We report here the preparation of a new class of selective inhibitors for the enzyme α-L-fucosidase. This enzyme hydrolyses the α-glycosidic linkage of α-L-fucosides by acid catalysis involving carboxylate residues. Our inhibitors are suitable for further derivatization. Coupling to carrier proteins and immunizations should lead to α-L-fucosidase catalytic antibodies.



[1] a) Reymond, J.-L.; Janda, K. D.; Lerner, R. A. *Angew. Chem. Int. Ed. Engl.* **1991**, *30*, 1711; b) Shabat, D.; Sinha, S. C.; Reymond, J.-L.; Keinan, E. *Angew. Chem. Int. Ed. Engl.* **1996**, *35*, 2628.

[2] Janda, K. D.; Lo, L.-C.; Lo, C.-H. L.; Sim, M.-M.; Wang, R.; Wong, C.-H.; Lerner, R. A. *Science* **1997**, *275*, 945.

Organic Chemistry **132**

A non-Hydrolizable Phospho-Histidine Analog

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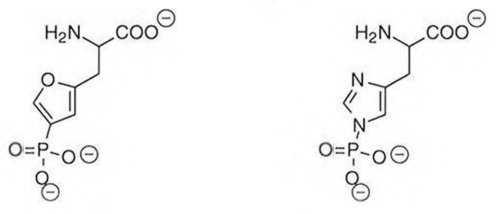
Universität Bern, Dept. für Chemie & Biochemie, Freiestr. 3, 3012 Bern

Transient histidine phosphorylation has been characterized in several phosphorylation cascades such as the bacterial phosphotransferase system.[1] Identification of phosphorylated hisitidine residues in peptides and proteins is very difficult due to the hydrolytic lability of the N-P bond in these derivatives. Here we report the synthesis of unnatural amino-acid **1**, a novel isosteric analog of phospho-histidine. Its incorporation into peptides should facilitate evaluation of biological properties of phospho-histidine.



[1] Meadow, N. D.; Fox, D. K.; Roseman, S. *Annu. Rev. Biochem.* **1990**, *59*, 497.

Organic Chemistry **133**

NMR Structural Studies of a Point-Mutant of the Carboxy-Terminal Domain of Quail Cysteine and Glycine-Rich Protein qCRP2

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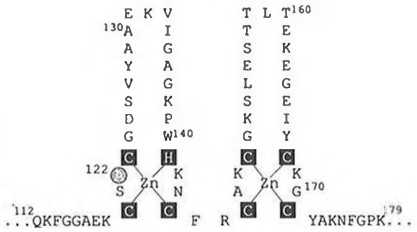
Institute of Organic Chemistry, *Institute of Biochemistry, University of Innsbruck, A-6020 Innsbruck

Cysteine and glycine-rich proteins (CRPs) are implicated in diverse processes linked to cellular differentiation and growth control. They contain so-called LIM domains, each formed by two zinc-binding units of the CCHC and CCCC type. We report here on NMR studies of the point mutant qCRP2(lim2-R122A) and compare it to wild-type qCRP2(lim2) [1]. The structural determinants governing the relative orientation of the two zinc-binding motifs and possible functional implications are discussed.



Graph of the C-terminal LIM domain of the point mutant CRP2(lim2-R122A)

[1] R. Konrat, R. Weiskirchen, B. Kräutler and K. Bister, *J. Biol. Chem.* **272**, 12001, 1997

Organic Chemistry **134**

Inhibition studies of Porphobilinogen Synthase from *Escherichia coli:* Site-selective Inhibitors ?

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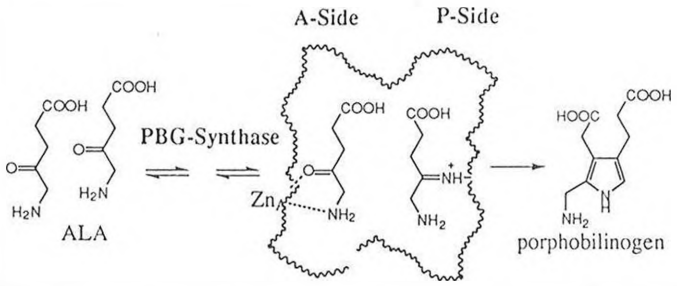
University of Neuchâtel, Institute of Chemistry, CH-2000 Neuchâtel

Porphobilinogen Synthase (PBGS, E.C.4.2.1.24) is the second enzyme in the biosynthesis of tetrapyrrolic natural products like porphyrins, chlorophylls and corrins. This enzyme catalyses in a asymmetric fashion the formation of porphobilinogen (PBG) starting from two molecules of 5-aminolevulinic acid (ALA). The same substrate has to be recognised in the active site in two different positions: the A Side and the P Side



Using substrate analogues, two different dissociation constants from the P Side and the A Side have been determinated by dialysis [1]. Based on these results the behaviour of the different inhibitors can be interpreted. According to the type of inhibition, we could distinguish the site of interaction of our inhibitors with the enzyme PBGS.

[1] E.K. Jaffe, W.R. Abrams, H.X. Kaempfen, K.A. Harris, *Biochemistry* **1992**, 31, 2113.

Organic Chemistry **135**

Synthesis and Determination of the Absolute Configuration of Some Metabolites of *Streptomyces Antibioticus* Tü 99

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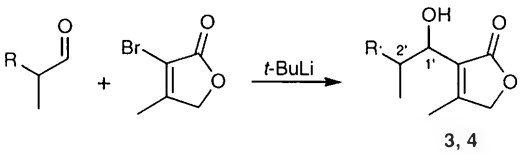
A few years ago we reported the isolation of some novel secondary metabolites (**3**, **4**) of *Streptomyces Antibioticus* Tü 99 [1]. A number of similar butenolides with an A-factor-like structure play an important role in cell differentiation and they also control the antibiotic production in *Streptomyces*. Therefore, we tried to determine the absolute configuration of the compounds **3** and **4** by synthesis. The chiral center C(2') in molecule **4** was obtained from optically pure 2-methylbutanal. The resulting diastereomers were separated by HPLC and the configuration at C(1') was dertemined by derivatisation with Mosher's acid followed by NMR analysis [2].



3, **4**

3: R = CH_3

4: R = CH_2CH_3

[1] D. Braun, N. Pauli, U. Séquin, H. Zähner, *FEMS Microbiol. Lett.*, **1995**, *126*, 37.

[2] J.A. Dale, H.S. Mosher, *J. Am. Chem. Soc.*, **1973**, *95*, 512.

Organic Chemistry **136**

Selective Total Synthesis of Chlorins with Annellated Quinones for the Investigation of Symmetry Effects on Light Induced Electron Transfer

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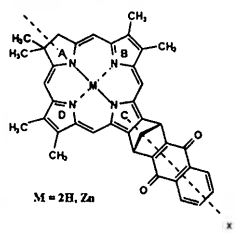
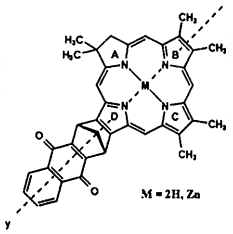
In order to investigate the effect of the molecular symmetry on the light induced electron transfer in chlorin-quinone dyades we aimed at the synthesis of chlorin-quinone models **1** and **2** in which the quinone is either orientated along the x-axis where the chlorin is intersected at the reduced ring A and the opposite C ring (**1**) or along the y-axis which intersects the chlorin along the B and D rings (**2**).



chlorin **1**



chlorin **2**

We will report on the totalsynthesis of this novel chlorin-quinone models **1** and **2** [1] by which a new pathway had to be developed for the ring C building block in chlorin **1** and the ring D building block in chlorin **2**.

[1] Y. Abel, F.-P. Montforts, *Tetrahedron Lett.* **1997**, *38*, 1745-1748.

Organische Chemie **137**

2'(*S*)-Ethynyl Oligodeoxynucleotides: Synthesis and Pairing Properties

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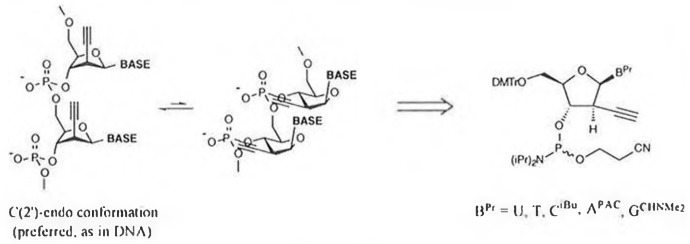
DNA double helices are capable of adopting a multitude of conformations whereas double-stranded RNA is confined to A-form duplexes. Thus, selectivity for a single-stranded DNA complement should be possible if an A-form conformation of the resulting double helix is not accessible. To restrict the conformational freedom of individual nucleosides in an ideal B-form double helix we sought to introduce an (*S*)-configured ethinyl substituent at the C(2')-position of deoxynucleosides. We assumed that in such an oligodeoxynucleotide the individual nucleosides are adopting a C(2')-*endo* conformation, typical of B-form DNA double helices, because the alternative C(3')-*endo* (RNA) conformation would lead to sterically unfavorable interactions with the 3'-neighbouring nucleotide.



We will report on the synthesis of the corresponding phosphoramidite building blocks and oligonucleotides thereof as well as the pairing properties of this novel DNA analog. [1]

[1] R. Buff, J. Hunziker, *Bioorg. Med. Chem. Lett.* **1998**, *8*, 521.

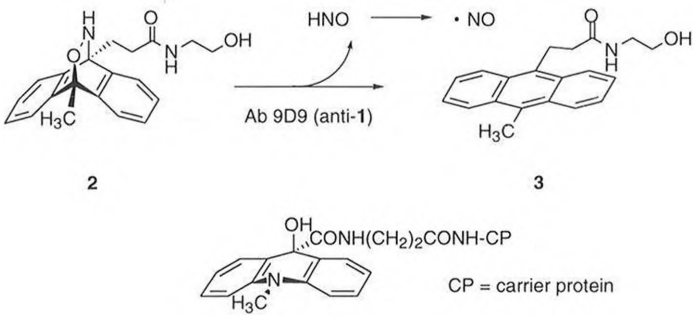
Organic Chemistry **138**

Effect of HTS on the Discovery of Catalytic Antibodies

Nicolas Bensel, N. Bahr, M. T. Reymond and J.-L. Reymond*

Universität Bern, Dept. für Chemie & Biochemie, Freiestr. 3, 3012 Bern

Nitroxyl synthase Ab-9D9 (anti-**1**) catalyzes the release of nitroxyl from prodrug **2**.[1] High throughput screening (HTS) for catalysis is readily carried out in cell culture media by following the release of anthracene **3** by fluorescence. HTS of hybridoma (ca. 12'000 individual samples) derived from immunizations with **1** and analogs **4** and **5** leads to the isolation six new catalytic antibodies, the best of which are ten times more efficient than Ab-9D9. These experiments show that HTS for catalysis allows reproducible isolation of catalytic antibodies and significant catalysis improvement.



1 (X = OH)
4 (X = CN)
5 (X = H)

[1] Bahr, N.; Güller, R.; Reymond, J.-L.; Lerner, R.A. *J. Am. Chem. Soc.* **1996**, *118*, 3550.

Organic Chemistry **139**

Aromatic Nanostructures with Thiophenyl Substituents

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Laboratoire de Chimie Supramoléculaire, ISIS, Université Louis Pasteur, 4 rue Blaise Pascal, F-67000 Strasbourg

Polythiophenyl substituted aromatic systems have been shown to be easily reducible[1] and are therefore potential building blocks for electroactive nanoscale molecular structures. They display favorable properties regarding their stability, solubility, accessibility and variety. A perthiophenyl substituted benzene motif has already been used as a reducible subunit in a potassium cryptate[2] as well as for the assembly of linear diacetylene-linked molecular rods[3].

To construct more advanced diacetylene linked polythiophenyl substituted benzene structures new building blocks are required.

A *meta* diacetylene-substituted tetrathiophenyl substituted benzene gives access to an angle of 120° in the diacetylene linked benzene motif and allows access to bent nanostructures.
The required building block is synthesized by nucleophilic aromatic substitution of the chlorinated *meta*-terephtalaldehyde with sodium thiophenylates. The aldehydes were converted to dibromoolefins, and subsequently to TBDMS-protected acetylenes. *Hay* or *Glaser* coupling allows for the connection of the deprotected acetylenes.

Addition of push and/or pull substituents may impart NLO properties to these materials. In particular the combination of rigid conjugated systems surrounded with strong polarizable sulfur atoms provides potential NLO features.
Wittig- and *Knoevenagel*-reactions allow the addition of push and/or pull substituents to tetrathiophenyl substituted *para*-terephtalaldehyde.

With these new building blocks in hand, a variety of new nanoscale structures with promising optical and electrochemical features may be designed. Cyclic thiophenylsubstituted conjugated aromatic systems are one example.

[1] J.H.R. Tucker, M. Gingras, H. Brand, J.-M. Lehn, *J. Chem. Soc., Perkin. Trans. 2* **1997**, 1303.
[2] M. Mayor, J.-M. Lehn, *Helv. Chim. Acta* **1997**, *80*, 2277.
[3] M. Mayor, J.-M. Lehn, K.M. Fromm, D. Fenske, *Angew. Chem., Int. Ed. Engl.* **1997**, *36*, 2370.

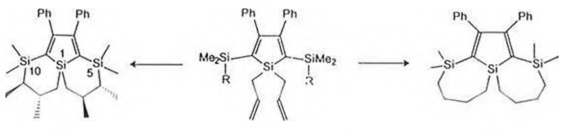
Organic Chemistry **140**

Synthesis of Bi- and Tricyclic Siloles

Zhu Teng and Reinhart Keese*

Department of Chemistry and Biochemistry, University of Bern, Freiestrasse 3, CH-3012 Bern

A variety of routes were investigated for the synthesis of tricyclic siloles. The two tricyclic silaalkanes **2** and **4** were synthsized via cyclozirconation[1] and intramolecular radical induced reaction from siloles **1** and **3** , respectively. Cyclozirconation of **1** showed high stereoselectivity, giving the trans isomer **2** exclusively. The radical reaction of **3** with Bu_3SnH/AIBN gave **4** in a highly regioselective reaction via a 7-endo mode. No 6-exo products have been detected. The structures of tricyclic silaalkanes have been confirmed by X-ray structure analysis. Further cyclization reactions of unsaturated silanes using transition metal methodology will be presented.



2 **1** R= Vinyl; **3** R= CH_2I **4**

1. Z. Teng, C. Boss, R. Keese, *Tetrahedron* **1997**, *53*, 12979-12990.

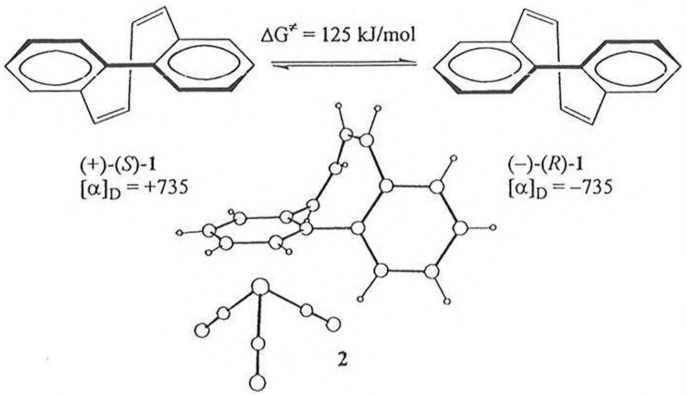
Organic Chemistry **141**

Synthesis and Characterisation of Tricarbonylchromium Complexes of Dibenzo[*a,c*]cyclooctene

M.T. Damiano, G. Bernardinelli, and U. Burger

Department of Organic Chemistry and Laboratory of X-Ray Crystallography, University of Geneva, Quai E. Ansermet 32, 1211 Genève 4

The atropisomers of dibenzo[*a,c*]cyclooctene (**1**) are separable compounds. They are protected from racemisation by an activation barrier of 125 kJ/mol [1][2]. We report on the synthesis and the chiroptical properties of their tricarbonylchromium complexes which combine planar with axial elements of chirality. The (R,S)-isomer (**2**) is depicted below.



[1] P.A. Lottaz, T.R.G. Edwards, Y.G. Mentha, U. Burger, *Tetrahedron Lett.* **1993**, *34*, 639.
[2] U. Burger, P.A. Lottaz, P. Millasson, and G. Bernardinelli, *Helv. Chim. Acta* **1994**, *77*, 850.

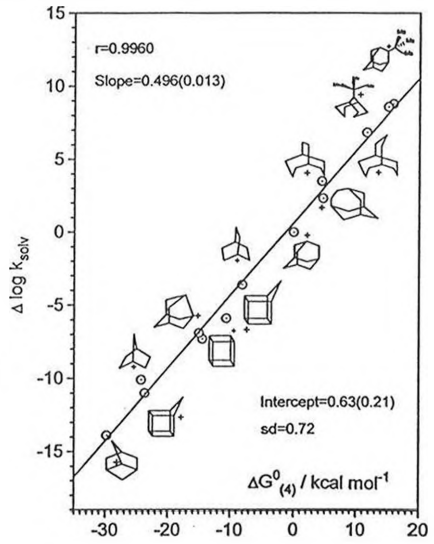
Organic Chemistry **142**

The Stability of Bridgehead Carbenium Ions in the Gas Phase; Experiment and Theory

Paul Müller, José-Luis M. Abboud, and Jiri Mareda

Department of Organic Chemistry, University of Geneva, CH-1211 Geneva 4, Switzerland

The stability of bridgehead carbenium ions has been measured in the gas phase from dissociative proton attachment (DPA) of bromides, chlorides and alcohols using FT-ICR. The stabilities of the ions, relative to that of their precursors, correlate with the rates of solvolysis of the corresponding bridgehead derivatives. The experimental ion stabilities are in full agreement with theoretical values obtained at the MP2/6-311G** level.



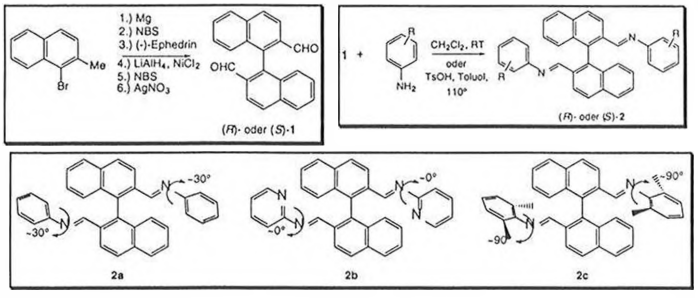
Organische Chemie **143**

Neue axial-chirale Diimin Liganden, Synthese und Charakterisierung

M.Schneider, A.J. Rippert

Org.-chem. Institut, Universität Zürich, Winterthurerstr. 190, 8057 Zürich

Der optisch aktive Dialdehyd **1** lässt sich in sechs Stufen, inklusive der Racematspaltung, aus 1-Bromo-2-methylnaphtalin herstellen [1]. Mit einer Vielzahl von unterschiedlich substituierten aromatischen Aminen lässt sich **1** in einer Kondensationsreaktion in die entsprechenden axial-chiralen Diimin Liganden **2** überführen.
Die Bildung der gewünschten Produkte benötigte recht unterschiedliche Aktivierungsenergien. In manchen Fällen verlief die Umsetzung bereits bei Raumtemperatur glatt und in Ausbeuten von 70-94%, in den anderen Fällen musste in Toluol unter Rückfluss in Anwesenheit katalytischer Menge Toluolsulfonsäure gekocht werden, damit die gewünschten Produkte erhalten wurden.
Anhand der CD-Spektren können die Diimin Liganden **2** in drei Kategorien eingeteilt werden. 1.) Durchkonjugation der aromatischen Systeme, wie dies in **2a** der Fall ist. 2.) Planare Systeme die auf eine Wasserstoffbrücke des Imin-Wasserstoffatoms mit dem Heteroatom im aromatischen Ring schliessen lassen, Bsp. **2b**. 3.) Eine Anordung des Doppelbindungssystems durch sterische Wechselwirkungen wie im Dialdehyd **1**, Bsp. **2c**. Die Anordung der aromatischen Ringe sowie der C=N Doppelbindung konnten im Fall **2a** und **2b** durch eine Röntgenkristallstrukturanalyse bestätigt werden [2].



[1] H. Brunner, J. Goldbrunner, *Chem. Ber.* **1989**, *122*, 2005.
[2] M. Schneider, A.J. Rippert, in Vorbereitung.

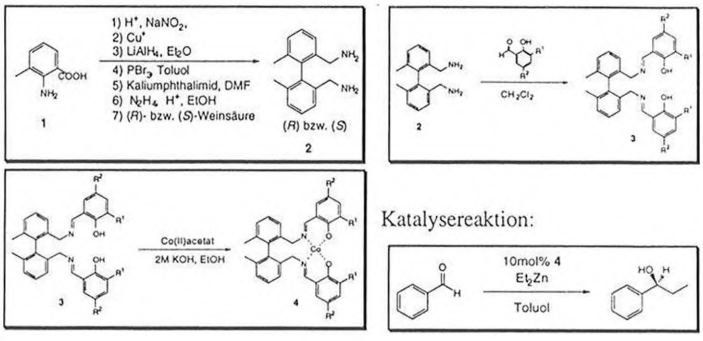
Organische Chemie **144**

Neue chirale Co(II)-Katalysatoren für die enantioselektive Reduktion von Benzaldehyd mit Diethylzink

F. Keller, A.J. Rippert*

Organisch-chemisches Institut, Universität Zürich, Winterthurerstr. 190, 8057 Zürich

Das für den Katalysator wichtige, axialchirale Biphenylgerüst lässt sich synthetisch einfach und in guten Ausbeuten aus 2-Amino-3-methylbenzoesäure erhalten (**1**→**2**). Mit verschieden substituierten Salicylaldehyden kann mittels Iminkondensation eine Vielzahl vierzähniger *N,N,O,O*-Liganden aufgebaut werden (**2**→**3**). Durch Komplexierung mit verschiedenen Metallen (Co, Cu, Ni etc.) erhält man die entsprechenden Katalysatoren (**3**→**4**).
Die verschiedenen Metallkomplexe wurden in der Reduktion von Benzaldehyd mit Diethylzink eingesetzt. Die besten Resultate wurden mit Co(II)-Komplexen gefunden, welche an R^1 Ethoxy-Substituenten trugen (bis zu 90%*ee*). Dabei scheint der Sauerstoff der Alkoxyfunktion unerlässlich zu sein; aufgrund der Ergebnisse wird als aktive Spezies ein bimetallischer Komplex postuliert [1]. Allerdings sind auch sterische Faktoren beteiligt: sowohl einfachere (Methoxy-) als auch anspruchsvollere Substituenten (Benzyloxy-) führen zu deutlich geringeren Enantiomerenüberschüssen.



[1] F. Keller, A.J. Rippert, *Helv. Chim. Acta*, in Vorbereitung.

Organic Chemistry **145**

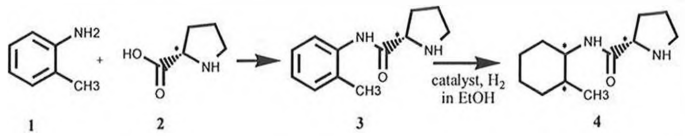
Diastereoselective Hydrogenation of Aromatic Compounds

V.S. Ranade and R. Prins

Laboratory for Technical Chemistry, ETH Zürich, CH-8092 Zürich

A substituted cyclohexane ring is a constituent of several biologically active molecules. It can be formed by hydrogenation of a corresponding substituted aromatic compound. One way of inducing stereospecifity during hydrogenation is to bind the aromatic substrate to a chiral auxiliary (diastereoselective hydrogenation). There are very few examples illustrating diastereoselective catalytic hydrogenation of aromatics.

Besson *et al.* have reported about the diasteroselective hydrogenation of *o*-toluic acid using the amino acid, (S)-proline as the chiral auxiliary [1]. The present work exemplifies the chiral auxiliary aided diastereoselective hydrogenation of subsituted aromatic amines with *o*-toluidine (**1**) using the same chiral auxiliary (**2**). The hydrogenation was performed on supported noble metal catalysts. Thus, hydrogenation of (S)-proline-2-methylanilide (**3**) yielded both the *cis* and the *trans* isomers of (S)-proline-2-methylcyclohexylamide (**4**).



1 2 3 4

The activity of the catalysts varied widely depending on the nature of the noble metal, the support and the process conditions. The *cis-trans* selectivity was found to be fairly independent of all these parameters. The diastereoselectivity was almost independent of all the parameters investigated, but dependent on the nature of the noble metal.

[1] Besson, M., Blanc, B., Campelet, M., Gallezot, P. Nasar, K., and Pinel, C., *J.Catal.* **170**, 254 (1997).

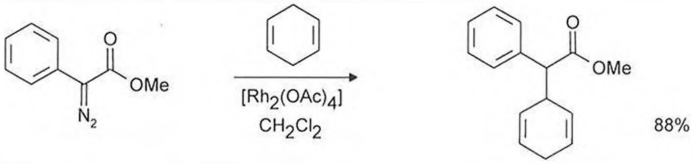
Organic Chemistry **146**

C-C Bond Formation *via* Carbon-Hydrogen Insertion of Metal Carbenoids

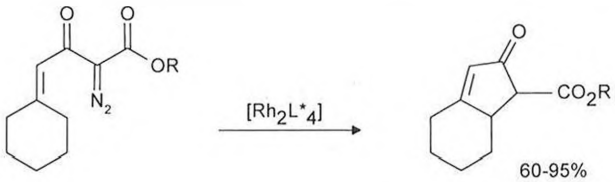
Sarah Tohill, Esther Maîtrejean and Paul Müller

Departement de Chimie Organique, Université de Genève
30, Quai Ernest Ansermet, CH-1211-Genève

The decomposition of diazo compounds by transition metal catalysts of Cu(II) or Rh(I) affords products derived from cyclopropanation of double bonds, or from insertion into carbon-hydrogen bonds. We have investigated the carbene selectivity for insertion *vs* cyclopropanation in function of the carbene, the catalyst and the substrate. Exceptionally high selectivity for insertion was observed in the case of $[Rh_2(OAc)_4]$-catalysed methyl phenyldiazoacetate insertion into cyclohexa-1,4-diene.



The intramolecular CH-insertion of α,β-unsaturated diazoketones and diazoketoesters produces substituted cyclopentanones in good to excellent yields. The enantioselectivity of these insertions has been investigated with a series of chiral Rh(II) carboxylates and carboxamidates, and with Cu(I)-catalysts and will be discussed.



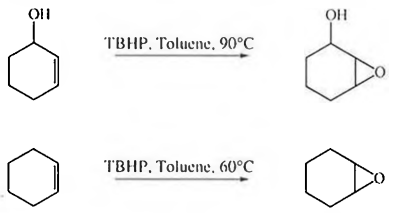
Organische Chemie **147**

Organically Modified Titania-Silica Aerogels as Effective Catalysts for the Epoxidation of Allylic Alcohols

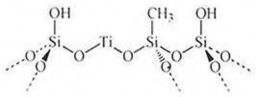
Christian A. Müller, Tamas Mallat, and A. Baiker

Laboratorium für Technische Chemie, ETH Zentrum, CH-8092 Zürich

Mesoporous, methyl-modified titania-silica aerogels have been found to exhibit superior activity and selectivity in the epoxidation of various allylic alcohols with *tert*-butylhydroperoxide (TBHP) as oxidant when compared to the performance of the unmodified catalyst. As an example, the epoxidation of 2-cyclohexen-1-ol has been studied and compared with the oxidation of cyclohexene.



Possible structure of methyl-modified titania-silica aerogel:



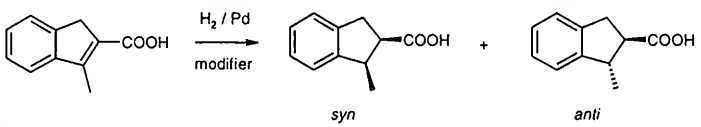
Whereas the rate of the epoxidation of cyclohexenol is enhanced by the surface modification, the epoxidation of cyclohexene is suppressed by the methyl group. This behavior could be generalized for a series of allylic alcohols and olefins.

Organic Chemistry **148**

Enantioselective Hydrogenation over Palladium: *syn* or *anti* Addition of Hydrogen

K. Borszeky, T. Mallat and A. Baiker
Laboratorium für Technische Chemie ETH-Zentrum, CH-8092, Zürich

Recently we have proposed a mechanistic model for the enantioselective hydrogenation of alkenoic acids over cinchonidine-modified Pd/alumina [1]. On the basis of our model the absolute configuration of the major enantiomer is predictable, assuming that the two hydrogen atoms are added from the Pd surface through *syn* addition. However, the general validity of *syn* addition in liquid phase hydrogenations on metal catalysts has been questioned [2]. To confirm our model we have investigated the addition of hydrogen using 3-methylindene-2-carboxylic acid as a model compound.



syn *anti*

We found that hydrogen was always added from the metal surface (*syn* addition) and the small amount of *anti* isomer (*syn* : *anti* = 200 : 1 – 20 : 1) was produced after isomerization of the reactant and/or intermediate.

1. K. Borszeky, T. Mallat and A. Baiker, *Tetrahedron: Asymmetry*, **1997**, *8*, 3745.
2. A. Tungler, T. Tarnai, T. Mathe, G. Toth, J. Petro and R. A. Sheldon, *Chiral reactions in Heterogeneous Catalysis, Plenum*, **1995**, 151.

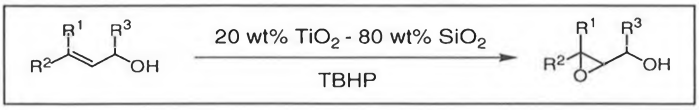
Organic Chemistry **149**

Selective Epoxidation of Allylic Alcohols with a Titania-Silica Aerogel

Marco Dusi, Tamas Mallat, and Alfons Baiker

Laboratorium für Technische Chemie, ETH - Zentrum, CH - 8092 Zürich

The best solid epoxidation catalysts are based on Ti and Si, including titania-on-silica, titania-silica mixed oxides and Ti-substituted molecular sieves. Most of the earlier studies described the oxidation of simple olefins, such as 1-hexene and cyclohexene. Selective epoxidation of allylic alcohols is more demanding due to competitive redox and acid-catalyzed reactions. Here we report that a titania-silica aerogel, synthesized by a sol-gel process followed by semicontinuous extraction with supercritical CO_2, can provide good reaction rates and epoxide selectivities in the oxidation of various allylic alcohols possessing a terminal or an internal double bond, as well as of cycloalkenols.



The titania-silica aerogel possessed an amorphous mesoporous structure with an average pore diameter of 9 nm and 680 m^2g^{-1} BET surface area. FTIR and UV spectroscopic analysis indicated a high dispersion of Ti in the silica matrix.

TBHP was used as oxidant for the epoxidation reactions. A careful *in situ* predrying of the (hydrophilic) catalyst at 473 K and addition of zeolite 4Å to the reaction mixture provided high rate and selectivity in the oxidation of open chain, unbranched allylic alcohols. Zeolite 4Å exerted a double effect by eliminating water formed during reaction and by acting as a base. In case of some other alkenols hydrophobisation of the catalyst surface in toluene and addition of $NaHCO_3$ (beside zeolite 4Å) to the reaction mixture had a substantial positive influence on the reaction rate and selectivity. Epoxide selectivities up to 91-97 % at 70-96 % olefin conversions have been achieved in 1 h using only 4 % or lower catalyst / substrate mass ratio.

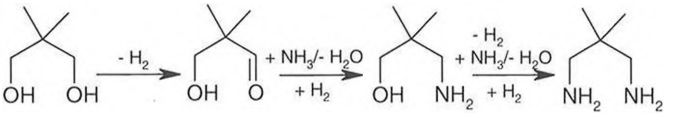
Organic Chemistry **150**

Continuous production of primary diamines in supercritical ammonia

Achim Fischer, Tamas Mallat and Alfons Baiker
Laboratorium für Technische Chemie, ETH-Zentrum, CH-8092 Zürich

The heterogeneously catalyzed amination of alcohols has been established as the industrially most important process for the manufacture of a variety of aliphatic and aromatic amines [1][2]. On the contrary, the selectivities and yields are usually low in the synthesis of primary aliphatic diamines from the corresponding diols and ammonia.

Here we report the amination of 1,3-propanediol and 2,2'-dimethyl-1,3-propanediol to the corresponding primary diamine in supercritical ammonia.



The experiments were conducted in a continuous tubular reactor over a Co-Fe and a commercial Ni catalyst, in the temperature range of 150-250 °C and at a molar feed ratio of the reactants R-OH/NH_3 = 1:40. A striking change of the selectivity to the desired diamine was observed in the near critical region of ammonia (T_c = 132 °C, P_c= 114 bar). The improved diamine selectivities were found to be due to the suppression of hydrogenolysis and degradation side reactions.

[1] A. Fischer, T. Mallat, A. Baiker *Catal. Today*, **1997**, *37*, 167.
[2] T. Mallat, A. Baiker, in G. Ertl, H. Knözinger, J. Weitkamp (Eds.): *Handbook of Heterogeneous Catalysis, Vol. 5*, VCH-Verlagsgesellschaft, Weinheim **1997**, 2334.

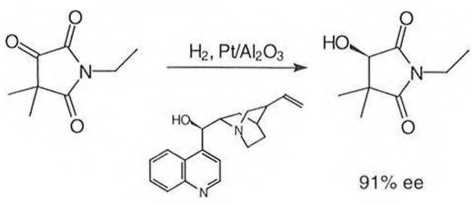
Organic Chemistry **151**

Enantioselective hydrogenation of a cyclic imidoketone over chirally modified Pt/Al_2O_3

N. Künzle, A. Szabo, M. Schürch, G. Wang, T. Mallat, A. Baiker

Laboratorium für Technische Chemie, ETH-Zentrum, CH-8092 Zürich

In a systematic study of the hydrogenation of a cyclic imidoketone (1-ethyl-4,4-dimethylpyrrolidine-2,3,5-trione) over chirally modified Pt metals, a remarkable enantiomeric excess (ee) of 91% was obtained.



Cinchonidine

In the study, the influence of several parameters such as solvent polarity, temperature, hydrogen pressure, modifier (cinchonidine) concentration and mass transport limitation were examined. One of the most important parameters was the concentration of the modifier. The maximum of 91% enantiomeric excess was achieved at 9 µmol l^{-1} cinchonidine in toluene, which value corresponds to a substrate:modifier molar ratio of 70'000. It should be emphasized that no special pretreatment is required for establishing the "chiral environment" on the platinum surface; the surface cinchonidine concentration is controlled by its bulk concentration and by the competitive adsorption of hydrogen, substrate and solvent.

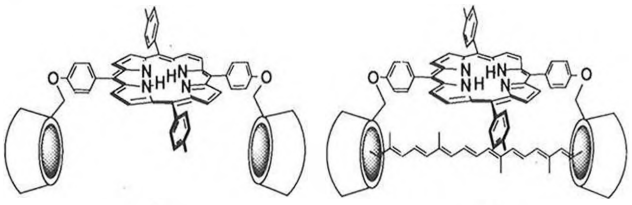
Organic Chemistry **152**

A Synthetic Receptor for β,β-Carotene - Towards an Enzyme Mimic Capable of Performing 15,15' Double Bond Scission.

Richard R. French[a], Jakob Wirz[b] and Wolf-Dietrich Woggon[a].

[a]*Institut für Organische Chemie der Universität Basel, St. Johanns-Ring 19, 4056 Basel.*
[b]*Institut für Physikalische Chemie der Universität Basel, Klingelbergstrasse 80, 4056 Basel.*

The enzymes which cleave β,β-carotene to provide retinal, the precursor for retinol (vitamin A) are of significance to animal and human nutrition. To date, two modes of cleavage of β,β-carotene have been proposed: i) eccentric cleavage which yields apocarotinals which can be degraded to retinal by β-oxidation, and ii) central cleavage which gives retinal directly. We report here on the synthesis of a receptor **1** for β,β-carotene, and on the binding interaction between the two which yields inclusion complex **2**. Cyclodextrin dimer **1** was obtained via condensation of the corresponding *bis*-phenol porphyrin with 6-iodo-β-cyclodextrin in the presence of Cs_2CO_3. Fluorescence studies of the binding interaction between **1** and β,β-carotene gave a binding constant, K_a, of $2.48 \times 10^6 M^{-1}$. In a later stage of the work, a metal will be introduced into the porphyrin, in order to investigate the cleavage of the central double bond of β,β-carotene.



1 **2**

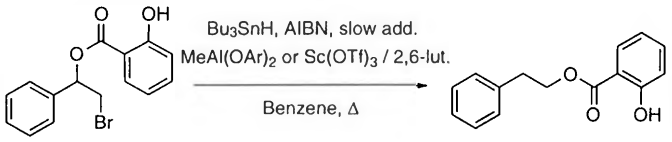
Organic Chemistry **153**

Rate-Enhancement of the Radical 1,2-Acyloxy Shift by Complexation with Lewis Acids

Emmanuel Lacôte and Philippe Renaud

Université de Fribourg, Institut de Chimie Organique
Pérolles, 1700 Fribourg.

The radical 1,2-acyloxy shift has attracted considerable interest since it has no equivalent in ionic chemistry.[1] Our interest for it was focused on the possibility of enhancing the rate of this rearrangement by complexation with Lewis acids. Aluminum and scandium derivatives gave the best results.[2] Full details and stereochemical implications of this work will be presented.



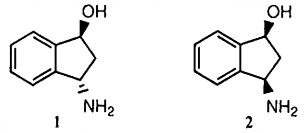
[1] A. L. J. Beckwith, D. Crich, P. J. Duggan, Q. Yao, *Chem. Rev.* **1997**, *97*, 3273-3312.
[2] E. Lacôte, P. Renaud, *Angew. Chem., Int. Ed.* **1998**, *37*, in press.

Organic Chemistry **154**

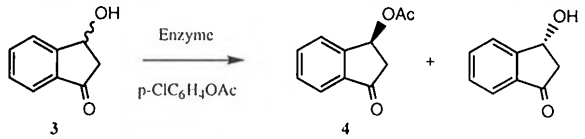
Synthesis of Optically Pure *cis* and *trans* 3-Amino-1-indanol by an Enzymatic Mediated Kinetic Resolution

Thomas P. Sieber, Claudine Papaux and Titus A. Jenny
Université de Fribourg, Institut de chimie organique, Pérolles, Fribourg

Optically active aminoalcohols find various applications as chiral auxiliaries and in the synthesis of chiral ligands of homogeneous catalysts and physiologically active compounds. Contrary to numerous chiral 1,2-aminoalcohols, only a few optically active 1,3-aminoalcohols were synthesized so far[1]. We devised now a short synthesis of all four 1,3-aminoindanol isomers starting from 1,3-indandione.



Zinc-reduction of 1,3-indandione affords 3-hydroxy-1-indanone **3** [2]. Kinetic resolution of the *S*-isomer and subsequent hydrolysis [3] of the separated acetate **4** yields both enantiomers of **3**. Hydrogenation of the corresponding oximes yields a mixture of **1** and **2** which is separated using camphersulfonic acid.



[1] P. Meier and E. P. Kündig, *Chimia* **1997**, *51*, 626
D. A. Evans, T. A. Brandt, *Tetrahedron Lett.* **1996**, *37*, 9143
[2] P. H. Lacy; D. C. C. Smith, *J. Chem. Soc. Perkin Trans. 1*, **1970**, 41
[3] H. Kajiro; S.-i. Mitamura; A. Mori; T. Hiyama, *Synlett* **1998**, 51

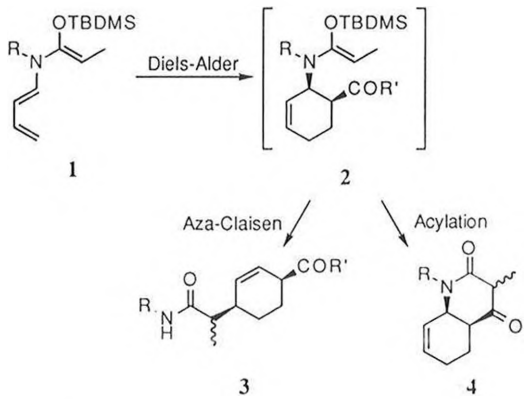
Organic Chemistry **155**

Diels-Alder Cycloaddition of *N*-Alkyl-*N*-Butadienyl Amides, *N*-Acyl-*N*-Butadienyl Amides and their *N,O*-Silyl Ketene Acetals Derivatives as Reagents for Tandem Reactions.

J.-M. Simone, J. Fernandez, K. Neuschütz, T. Thyrann and R. Neier*

Institut de Chimie de l'Université de Neuchâtel, CH-2000 Neuchâtel

Tandem reactions in organic synthesis are a useful tool. The goal of our work is to combine two reactions, namely Diels-Alder cycloaddition followed by either Aza-Claisen rearrangement or acylation [1]. The influence of changing the R group on N on the reactivity of the diene in the Diels-Alder reaction has been studied.



[1] A. Franz, P.-Y. Eschler, M. Tharin, R. Neier, *Tetrahedron* 1996, *52*, 11643

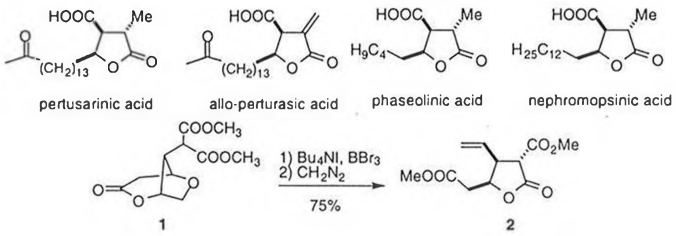
Organic Chemistry **156**

A General Synthesis of β,γ-cis Paraconic Acid

Andrea Forster and Philippe Renaud

Université de Fribourg, Institut de Chimie Organique, Pérolles, 1700 Fribourg, Switzerland

Paraconic acids are a class of trisubstituted γ-butyrolactones possessing attractive biological activities. The synthesis of β,γ-trans-paraconic acid is reported in the literature whereas of β,γ-cis disubstituted systems, such as pertusarinic, phaseolinic, allo-pertusaric and nephromopsinic acid appeared to be more difficult to prepare. We report now an easy access to this class of compounds. The key feature of this approach is a remarkable iodide mediated cleavage of the bicyclic system **1** followed by introduction of the γ-chain via a mixed Kolbe electrolysis.



Both enantiomeric forms of the paraconic acids are readily accessible since lactone **1** can be prepared from (+)- and (-)-7-oxabicyclo[2.2.1]hept-5-en-2-one via a reported procedure.[1]

[1] Forster, A.; Fitremann, J.; Renaud, P. *Tetrahedron Lett.* **1998**, *39*, 3485-3488

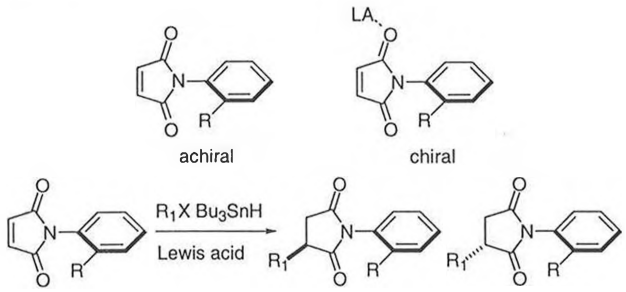
Organic Chemistry **157**

Stereoselective Radical Addition of N-Arylmaleimide Controlled by Lewis Acid

L. Quaranta and P. Renaud

Université de Fribourg, Institut de Chimie Organique, Pérolles, 1700 Fribourg

Recently, Lewis acids have been applied to control the stereochemistry of radical reactions [1]. We report here our effort to control the diastereo- and enantioselectivity of radical addition to ortho-substituted N-arylmaleimide derivatives [2]. Such radical traps are highly attractive because complexation with a Lewis acid generates a chiral axis. This particularity offers unique opportunities for enantioselective reactions [3].



[1] P. Renaud and M. Gerster, *Angew. Chem. Int. Ed.*, in print.
[2] D. P. Curran, H. Qi, S. J. Geib, N. C. De Mello, *J. Am. Chem. Soc.* **1994**, *116*, 3131.
[3] E. J. Corey and M. A. Letavic, *J. Am. Chem. Soc.* **1995**, *117*, 9616.

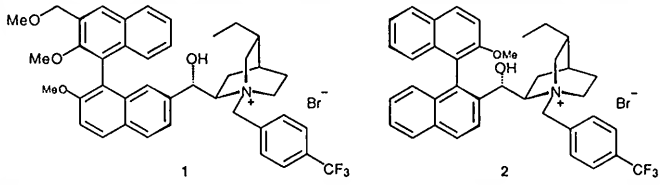
Organic Chemistry **158**

New Chiral Ligands for Enantioselective Phase Transfer Catalysis

L. Ducry, C. Meyers and F. Diederich*

Laboratorium für Organische Chemie der ETH Zürich, ETH-Zentrum, Universitätstrasse 16, 8092 Zürich

Phase transfer catalysis has become a very important method in asymmetric synthesis. Here we report our investigations in combining the chiral properties of cinchona alkaloids with those of binaphthyls in the hope to achieve high levels of enantioselectivity in the creation of all-carbon quaternary stereocenters. In order to benefit from the chirality of both residues, substitutions close to either the major or the minor groove of the binaphthyl moiety were considered. Computer calculations validated our hypothesis that the quaternary ammonium salts **1** and **2** would be suitable for selective complexation and hopefully enantioselective α-alkylation of rigid ketones.



The design, synthesis and catalytic properties of such molecules will be discussed.

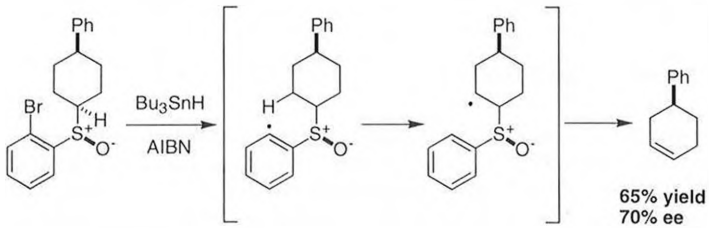
Organic Chemistry **159**

Preparation of Non-Racemic 4-Substituted Cyclohexenes by Radical Fragmentation of Sulfoxides

C. Imboden and P. Renaud

Université de Fribourg, institut de chimie organique, Pérolles, 1700 Fribourg

2-Sulfinylated radicals can be generated by a 1,5-hydrogen abstraction. They undergo a very rapid β-fragmentation. We report here a study of the stereoselectivity of the 1,5-hydrogen atom abstraction process starting from 4-substituted *ortho*-bromophenyl cyclohexyl sulfoxides. This process opens a new way to prepare optically active 4-substituted cyclohexene derivatives.



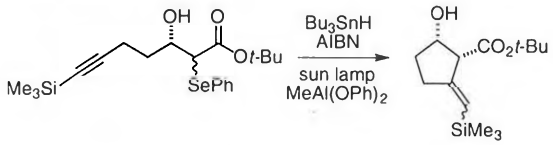
Organic Chemistry **160**

Simple and Efficient Stereocontrol of Radical Cyclization of β-hydroxyesters.

L. Andrau and P. Renaud

Université de Fribourg, institut de chimie organique, Pérolles, 1700 Fribourg

We have reported that *in situ*-generated aluminum alkoxides are particulary powerful for controlling the stereoselectivity of radical allylations of non-protected β-hydroxyesters [1]. The same approach can be applied to control the stereochemistry of radical cyclizations. For instance, in the presence of $MeAl(OPh)_2$, the reaction depicted below afforded the *cis*-2-hydroxycyclopentanecarboxylate with an excellent stereoselectivity.



cis/*trans* : 42/1

Applications of this approach to the construction of highly substituted bicyclic compounds will be presented.

[1] M. Gerster, L. Audergon, N. Moufid, P. Renaud, *Tetrahedron Lett.*, **1996**, *37*, 6335-6338.

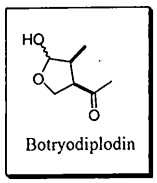
Organic Chemistry **161**

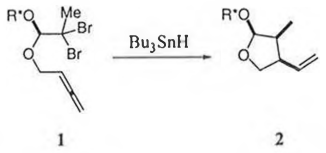
Efficient Synthesis to Botryodiplodin

Olivier Andrey, Philippe Renaud*, Felix Villar

Université de Fribourg, Institut de Chimie Organique, Pérolles, 1700 Fribourg

The radical cyclization of α-haloacetals reported by Ueno [1] and Stork [2] is a very efficient method for the preparation of polysubstituted tetrahydrofurans. We have recently demonstrated that the stereochemistry of this process can be controlled by the acetal center [3]. We report here the synthesis of botryodiplodin [4], a mycotoxin isolated from *Penicilium roqueforti* which possess antimicrobial and antileukemic activities. The key step of the synthesis was the cyclization of the dibromoacetal **1** to the all-cis tetrahydrofuran **2**. Optically pure material was obtained by using a chiral auxiliary.





[1] Ueno, Y.; Chino, K.; Watanabe, M.; Okawara, M.; *J. Am. Chem. Soc.* **1982**, *104*, 5564
[2] Stork, G.; Mook, R.; Scott, A. B.; *J. Am. Chem. Soc.* **1983**, *105*, 3741.
[3] Renaud, P.; Villar, F.; submitted
[4] Moreau, S.; Lablache-Combier, A.; Foulon, C.; *J. Org. Chem.* **1982**, *47*, 2358.

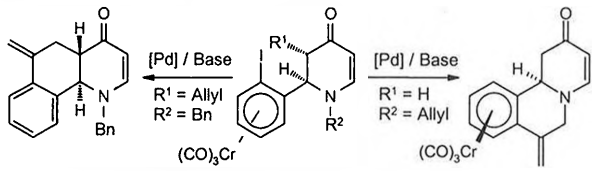
Organic Chemistry **162**

Planar Chiral Arene Chromium Complexes: Applications in Asymmetric Synthesis.

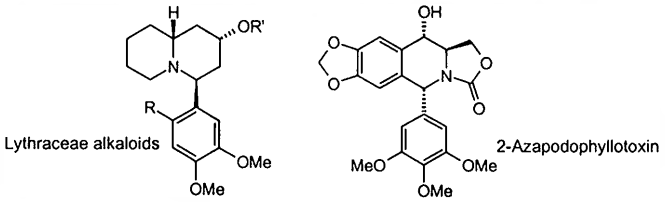
Krishna P. Kaliappan, E. Peter Kündig*, Hassen Ratni, and Dina M. Sigano

Département de Chimie Organique
Université de Genève, CH-1211 Genève 4, Switzerland

Planar chiral organometallic compounds have gained increasing importance in asymmetric organic synthesis. Following up on our recent article on aza-Diels-Alder reactions with enantiopure planar chiral arene complexes [1] we here report that the resulting hydropyridinone complexes can be used successfully in highly diastereospecific intramolecular Heck reactions to yield enantiopure hydroisoquinolines.



In further extension of our studies with planar chiral arene complexes, we also report our progress in applications to the asymmetric synthesis of several biologically active natural products and their analogues. E.g.



[1] Kündig, E.P., Xu, L.H.; Romanens, P.; Bernardinelli, G. *Synlett*, **1996**, 270.

Organic Chemistry **163**

o-Hydroxy-α-alkylbenzylamines: Synthesis of New Chiral Ligands for Asymmetric Catalysis

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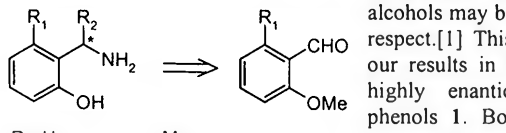
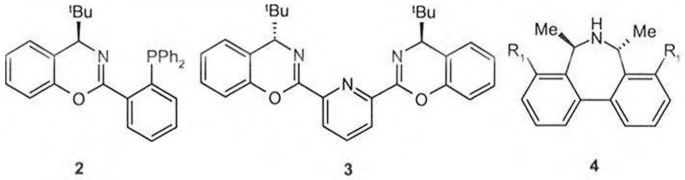
Unlike chiral 1,2-aminoalcohols which are readily available from natural sources, chiral 1,3-aminoalcohols are much less abundant. In recent years, the former have found wide application as building blocks for ligands for asymmetric catalysis. 1,3-Aminoalcohols may be of interest in this respect.[1] This study reports on our results in this area with the highly enantioenriched aminophenols **1**. Both, diastereoselective syntheses and efficient resolutions were developed for compounds **1**. The aminophenols were then converted into the diphenylphosphinoaryl benzoxazine ligand **2**, the C_2-chiral bis-benzoxazine ligand **3** and dibenzo[c,e]azepine **4**. The poster reports synthesis of **2**-**4**, X-ray structures of metal complexes of **2** and **3**, conformational studies of **4** and first applications in catalysis.



R_1=H, Me
R_2=Me, *i*-Pr, *t*-Bu, Me
1a, **1b**, **1c**, **1d**



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Organic chemistry **164**

Enantioselective Nucleophile/Electrophile Additions to Arene Chromium Complexes: An Approach to Tubipofurans

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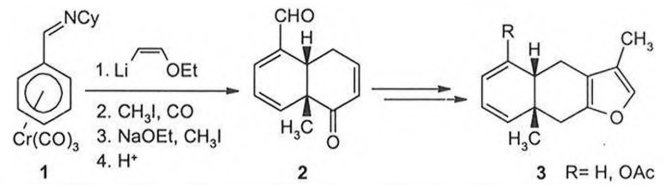
Université de Genève, CH-1211 Genève 4, Switzerland

Temporary complexation of an arene to the $Cr(CO)_3$ group provides an efficient entry to regio-and stereoselectively substituted alicyclic ring systems [1]. We here report on the progress of the application of this methodology to the syntheses of tubipofurans **3** - bioactive furanoterpenoids isolated from marine organisms [2]. The dearomatization/aldolisation sequence leading to **2** introduces in a one pot reaction two new stereogenic centers with complete control of relative stereochemistry.



In parallel to work on the transformation of the fused bicyclic enone **2** into the target molecules **3**, we have started work on an asymmetric variant that is based on our recent finding that organolithium reagents can be added with high enantioselectivity (>90% ee) to complex **1** in the presence of chiral diethers [3].

[1] Quattropani, A.; Anderson, G.; Bernardinelli, G.; Kündig, E.P. *J. Am. Chem. Soc.* **1997**, *119*, 4773.
[2] Iguchi, K.; Mori, K.; Suzuki, M.; Takahashi, H.; Yamada, Y. *Chem. Lett.* **1986**, 1789.
[3] Amurrio, D.; Khan, K.; Kündig, E.P. *J. Org. Chem.* **1996**, *61*, 2258.

Organic Chemistry **165**

Synthesis of natural Tetralones.

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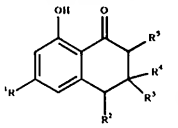
Institut de Chimie de l'Université de Neuchâtel,
Avenue de Bellevaux, 51, CH-2000 Neuchâtel

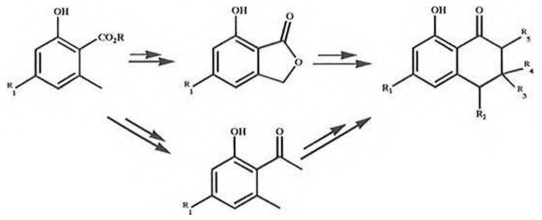
Recently, in the course of the phytochemical studies in our laboratory on different microorganisms (e.g *Ceratosystis fimbriata platani*[1] and *coffea sp* [2] and *stagonaspora* [3]) involved in plant diseases, several tetralone derivatives have been isolated. The structures of these compounds were elucidated by spectroscopic methods.



$R^1=R^2=R^4=R^5=H$ $R^3=OH$
$R^1=R^4=R^5=H$ $R^2=R^3=OH$
$R^1=R^3=R^4=H$ $R^2=R^5=OH$
$R^2=R^4=R^5=H$ $R^1=R^3=OH$
$R^4=R^5=H$ $R^1=R^2=R^3=OH$
$R^2=R^5=H$ $R^1=R^3=OH$ $R^4=CH_3$

To confirm their structures and to acquire sufficient quantities of material for bioassay, these compounds have to be synthesized.

Here, we report two different synthetic pathways which could be used for the preparation of most of tetralone derivatives.



[1] N.Bürki, Thèse de l'Université de Neuchâtel, **1996**
[2] Gremaud G. et Tabacchi R., *Phytochemistry*, **1996**, 1547-1549
[3] Nicolet B. et Tabacchi R., *Phytochemistry*, Submitted

Organic Chemistry **166**

A Novel Chiral Polyamine Template

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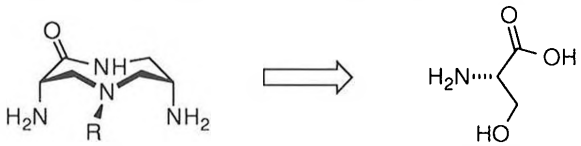
St. Johanns-Ring 19, CH-4056 Basel

Polyamines are well recognized as biologically interesting compounds as well as useful ligands for metal coordination or molecular recognition. Selective functionalization and chirality are necessary features needed to access more complex derivatives. Here we report on an easy synthesis of a chiral diamino-azalactam where the key step is a satisfactory monoreduction of a C2 symmetrical hydrazide obtained from L-serine [1]. Derivatives of this versatile building block are screened as novel enzyme mimics (e.g. vanadium haloperoxidase or phosphatases) [2] or as chiral metal ligands.



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Physical Chemistry **167**

Interactions between Graphite and Carbonate-Based Electrolytes

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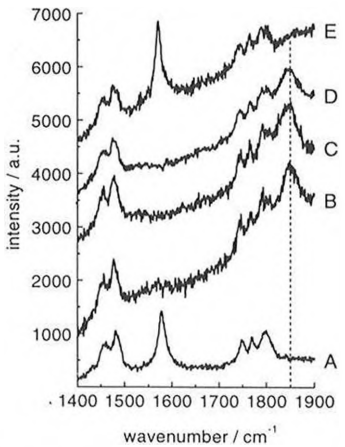
Graphite is widely used as electroactive component for lithium intercalation electrodes of Li^+-ion batteries. However, the irreversible charge loss due to the reductive decomposition of the electrolyte on graphite is still a challenge. In this work the electrolyte decomposition before and during lithium insertion is studied on graphite electrodes in ethylene carbonate (EC) based electrolytes.

Using in-situ mass spectrometry we demonstrated that the electrolytes are decomposed to form ethylene gas during the first lithium insertion half-cycle. We found that the more water the electrolyte contains, the less ethylene gas but the more hydrogen gas is evolved.

In-situ Raman microscopy experiments revealed a new band that occurs at 1850 cm^{-1} at low potentials (Figure, spectra B, C, and D). The band is preliminarily assigned to the formation of a complex between Li^+ and an EC based compound of a film reductively formed on the electrolyte/graphite interface.

Support from TIMCAL AG and the Swiss Federal Office of Energy is gratefully acknowledged.



In-situ Raman spectra acquired during the first Li^+ intercalation cycle of a graphite electrode at (A) 1130 mV, (B) 100 mV, (C) in the range of 15 to 0 mV, (D) 95 mV, and (E) 1235 mV vs. Li/Li^+.

Physikalische Chemie **168**

The cause of the yellow colour of activated silver-containing zeolite A

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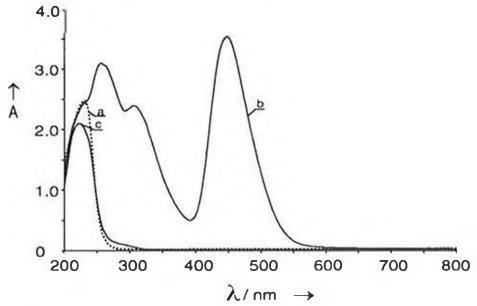
Freiestrasse 3, CH-3012 Bern

Colourless in the hydrated state, silver-containing zeolite A turns yellow to brick-red upon activation under vacuum. The reason for this phenomenon, which has been known since 1962, was discussed in context with the formation of Ag^0-clusters. The system was reinvestigated to quantify the observations and to understand the electronic structure with help of UV-vis spectroscopy and quantum chemical calculations. [1] It is now shown that a charge-transfer transition from the oxygen atoms of the zeolite lattice to the empty 5s-orbital of the silver ions is responsible for the yellow colouring, which is reversible with respect to desorption/adsorption of water. The graph shows UV-vis spectra of $Ag^+_6Na^+_6A$: freshly prepared (a), dehydrated at RT in UHV (b), rehydrated with pure water steam (c).



[1] R. Seifert, A. Kunzmann, G. Calzaferri, *Angew. Chem. Int. Ed.* **1998**, 37, No. 11

Physical Chemistry **169**

Nanostructured model catalyst systems and their use in the field of heterogeneous catalysis research

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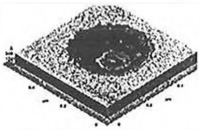
Laboratory for Technical Chemistry, ETH Zentrum, 8092 Zürich

Systems commonly used for studying model catalysis usually consist of metal particles having a broad distribution of size and shape. Other model systems, such as single crystals with more defined size and structure properties, provide only small active areas. Furthermore, most of the in-situ investigation methods must be applied under high or ultrahigh vacuum conditions. We present new model catalysts, with which we attempt to bridge the gaps between model and more industrially oriented catalysis research.

Our systems are made according to the following scheme: an oxidized Si wafer is covered with a layer of photo resist material, exposed to a laser interference pattern. Through the resulting resist grid the SiO_2 is structured by wet chemical etching (Ar ion etching is also possible). The resulting holes are loaded with metal particles by evaporation or by means of a spin coating procedure. Optimizing the methods enabled us to place single metal clusters in the holes, as shown in the picture on the right.



600nm × 600nm AFM picture of a nano-structured SiO_2 surface with a single Cu cluster inside a hole

We can structure entire 4 inch wafers and thus produce systems with an overall active area in the range of several square centimeters.

The structures, including their stability and chemical behaviour, were investigated to determine their usefulness in catalysis. The systems were sufficiently stable in the temperature regimes of interest (up to 500°C). Methods used for characterizing the catalysts are AFM, TEM, SEM, temperature-pro-grammed methods and XPS. For catalytic investigations of these samples specially designed flow-through reactors are used. First reactivity tests were carried out in UHV and in atmospheric pressure regimes with nanostructured samples and Pd films.

Physical Chemistry **170**

Hydrophobic Interactions of Metal-polypyridyl-complexes at the Surfaces of Starburst Dendrimers

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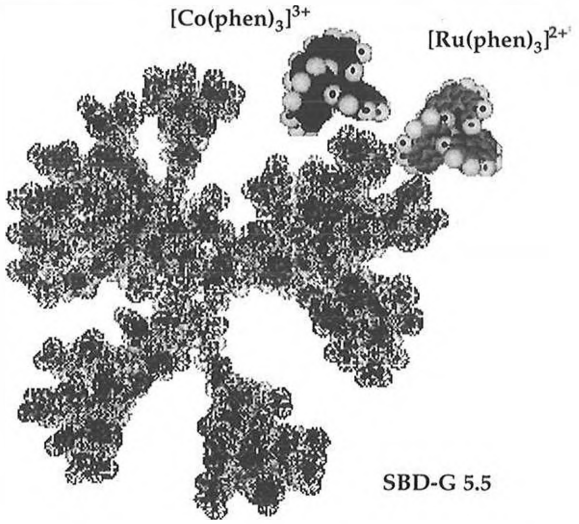
Lehrstuhl für Umweltmesstechnik am Engler-Bunte-Institut der Universität Karlsruhe, 76128 Karlruhe/Germany

The hydrophobic interaction of ruthenium(II)-tris-phenanthroline and cobalt(III)-tris-phenanthroline at the surface of different generations of starbrust dendrimers as model systems for enzymes and other microheterogeneous structures of biological importance have been studied by steady state and time resolved luminescence spectroscopy. A newly developed mathematical model for the data analysis will be presented [1].



[1] S. H. Bossmann, L. S. Schulman, D. ben-Avraham, C. Turro, N. J. Turro, *J. Phys. Chem.*, in print.

Physical Chemistry **171**

The adiabatic reaction path Hamiltonian approach applied to inversion tunneling spectra in aniline and hydrogen bond clusters

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Laboratorium für Physikalische Chemie, ETH Zürich (Zentrum), CH-8092 Zürich, Switzerland.

We investigate the influence of all vibrational modes on the NH_2 inversion tunneling dynamics of aniline [1]. The infrared absorption spectrum of aniline was recorded between 10 to 10000 cm^{-1}. The spectrum is analysed in terms of a reaction path Hamiltonian using an ab initio potential energy surface. The large amplitude motion is chosen as reaction path and is treated explicitly on a grid. All other internal degrees of freedom are treated adiabatically in the harmonic approximation. The theoretical treatment includes as essential extension of previous reaction path treatments the method of diabatic rotations, which decouples degenerate modes occurring at certain values of the reaction coordinate. We discuss the application to tunneling processes in hydrogen bonded cluster of hydrogen fluoride [2,3] as well as the theoretical relation to Miller's reaction path hamiltonian [4] and to the statistical adiabatic channel model [5,6].

[1] B. Fehrensen, D. Luckhaus, and M. Quack, *Z. Phys. Chem.*, (1998) in press

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[4] W.H. Miller, N.C. Handy, and J.E. Adams, *J. Chem. Phys.*, **72(1)**:99-112, 1980

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Physical Chemistry **172**

Intermolecular Bonding and Vibrations of 2-Naphthol•$(H_2O)_2$

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Departement für Chemie und Biochemie, Universität Bern, CH-3000 Bern 9

The 2-naphthol•$(H_2O)_2$ cluster has a cyclic hydrogen-bonded homodromic topology and is strcuturally similar to the cyclic water trimer. The resonant two-photon ionization $S_1 \leftarrow S_0$ spectra of 2-naphthol•$(H_2O)_2$ produced in supersonic beams exhibit *three* different features: an electronic origin *a* at 30377 cm^{-1} with a long progression of sharp vibrations spaced by ≈20 cm^{-1}, and two broad bands to the blue, *b* centered at 30536 cm^{-1} and *c* at 30676 cm^{-1}. A detailed UV-UV holeburning study revealed that there are three ground-state conformers *A, B* and *C* coexistent in the beam. *A* gives only sharp transitions, contributing most of band system *a*. Species *B* gives rise to weak sharp bands in *a* and all of *b*. *C* gives rise to weak transitions in *a* and all of *C*. Increasing deuteration of the cluster up to *d*-naphthol•$(D_2O)_2$ leads to progressive elimination of the sharp *a* band system, while *b* and *c* remain. This implies that the ground-state stability is largest for *C*, closely followed by *B*, and that *A* is less stable. *A* exhibits a strong $S_1 \rightarrow S_0$ fluorescence emission spectrum with two coupled ground-state vibrational modes at 19 and 35 cm^{-1}. *B* and *C* have very short fluorescence lifetimes $\tau_{fl} < 3$ *ns* and low fluorescence quantum yields $\phi_{fl} < 0.005$. Full *ab initio* structure optimizations of *trans*-2-naphthol•$(H_2O)_2$ were performed yielding three different conformers with *cyclic* binding topology. Harmonic vibrational frequencies were calculated for all three conformers, and compared to the $S_1 \rightarrow S_0$ fluorescence spectra.

Physical Chemistry **173**

INTERMOLECULAR VIBRATIONS IN CHIRAL PAIR COMPLEXES

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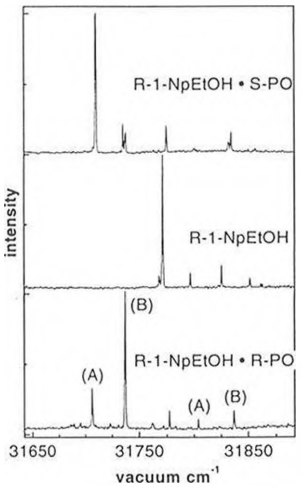
University of Bern, Department of Chemistry and Biochemistry, 3012 Bern

Hydrogen-bonded complexes of a chiral H-bond donor *M* and an also chiral H-bond acceptor *M'* were formed in supersonic jets and analyzed by various spectroscopic methods including resonant two-photon ionization and laser-induced fluorescence.

The systems under study include the UV-chromophores *R*-methyl benzyl alcohol (*R*-MBA), *R*-1-(1-naphthyl)-ethanol (*R*-1NpEtOH), and *R*-indanol (*R*-Ind) complexed to either *R*(+)- or *S*(-)-propylene oxide (PO). As the binary complexes *R•••R'* and *R•••S'* are diastereomers they must exhibit different optical spectra [1].

The bare *R*-1NpEtOH shows a strong electronic origin at 31771 cm^{-1}. The complex *R*-1NpEtOH•••*R*-PO shows two isomers (A) and (B), the origins of which are red-shifted by 65 cm^{-1} and 34 cm^{-1}, respectively. On the other hand for *R*-1NpEtOH•••*S*-PO only one isomer is found with an origin which is red-shifted by 61 cm^{-1} compared to the origin of the bare *R*-1NpEtOH.



Whereas the complexes of *R*-MBA with *R*- and *S*-PO showed strong fragmentation upon ionization [2], in the case of the *R*-NpEtOH•••(*R,S*)-PO complexes no fragmentation was observed.

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[2] A. Inauen, S. Leutwyler, *Chimia* **49** (1995) 270.

Physikalische Chemie **174**

Infrarotspektroskopie und Femtosekundendynamik von Tetrafluoriodethan (CF_3CHFI)

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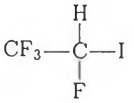
Laboratorium für Physikalische Chemie, ETH Zürich, CH-8092 Zürich

Wir haben die Schwingungsspektren des Tetrafluoriodethans (CF_3CHFI) vom fernen (20 cm^{-1}) bis in den nahen Infrarotbereich (14200 cm^{-1}) mittels FT-IR- und photoakustischer Spektroskopie bei Auflösungen zwischen 0.004 cm^{-1} und 1.0 cm^{-1} gemessen [1]. Die Positionen und integrierten Bandenstärken aller Fundamentalen, mehrerer Kombinationsschwingungen und Obertöne wurden ermittelt. Die Fundamentalen konnten durch den Vergleich mit ab initio berechneten harmonischen Frequenzen zugeordnet werden. Die Obertonspektren sind weitgehend von den Absorptionen des CH Chromophors dominiert und wurden mit Hilfe eines effektiven Hamiltonoperators [2] für die CH streck-knick Bewegung analysiert. Hier treten sowohl Fermi- als auch Darling-Dennisonresonanzen auf, sowie eine chirale, symmetriebrechende, anharmonische Kopplung $k_{sab} = 27 \pm 10\,cm^{-1}$. Auf der Grundlage der spektroskopisch bestimmten Parameter wurde die Femtosekundendynamik hochangeregter Schwingungszustände ermittelt. Zusätzlich wurden die Obertonspektren des CH Chromophors und die Wellenpaketdynamik im Normalkoordinatenraum auf der Basis von drei und vierdimensionalen ($1 \times \nu_{CH}, 2 \times \delta_{CH}, 1 \times \nu_{CF}$) ab initio Potentialhyperflächen berechnet [3].



[1] J. Pochert, M. Quack, eingereicht bei Mol. Phys.; [2] M. Quack, Annu. Rev. Phys. Chem. **41**, 839 (1990); [3] J. Pochert, M. Quack, M. Willeke, in Vorbereitung.

Physikalische Chemie **175**

Secondary Zn/O_2 - Cells with Improved Zinc Electrodes

F. Holzer and S. Müller
Paul Scherrer Institute, 5232 Villigen PSI, Switzerland

The most promising results for electrically rechargeable metal/air systems have been achieved with Zn/air systems. Their high theoretical specific energy (1085 Wh/kg) in combination with further advantages such as low price and environmental compatibility of all components make the Zn/air system a very attractive candidate for traction applications.

After improving considerably the cycle life behavior of the secondary Zn/O_2-cell by developing a durable perovskite-catalyzed bifunctional O_2-electrode [1] a great effort has been undertaken to demonstrate an adequate specific power with respect to applications in electric-vehicles. We will present the improvement in cell performance by applying cellulose [2] or graphite additives in rechargeable pasted Zn-electrodes. The cellulose fibers mitigate the effects of densification and the graphite additives improve the conductivity of the electrode. Under demanding discharge conditions (discharge in 1.5 hours), the 2.5 Ah Zn/O_2-cells still showed high specific energy data in the range of 80 - 100 Wh/kg.

The physical properties of variously prepared pasted zinc electrodes, as well as the electrochemical properties of the corresponding Zn/O_2-test cells will be presented.

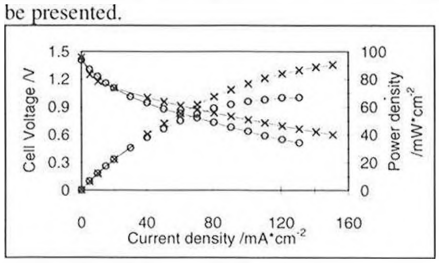


Fig. 1
Voltage, current density and power density delivered by Zn/O_2-cells with pasted zinc electrodes.

[1] S. Müller, F. Holzer, O. Haas, C.Schlatter, C.Comninellis, Chimia 49, 1995, 27
[2] S. Müller, F. Holzer, O. Haas, J. Appl. Elechtrochem., in press

Physical Chemistry **176**

Quantum Dynamics of polyatomic molecules during and after infrared multiphoton excitation

R. Marquardt, M. Quack and I. Thanopulos
Laboratorium für Physikalische Chemie, ETH Zürich (Zentrum),
CH-8092 Zürich, Switzerland.

We investigate the intramolecular dynamics of polyatomic molecules of high and low symmetry under the influence of strong coherent irradiation. For this purpose analytical multidimensional potential hypersurfaces and dipole moment surfaces have been developed [1,2]. The results are obtained in two steps: first, the vibrational spectrum and eigenfunctions for the field free molecuar Hamiltonian are calculated; then, the time dependant Schrödinger equation for the molecule-field system within the Floquet and QRA approximation is solved in the basis of the molecular eigenstates [3,4]. The time evolution of the molecular wave packet during and after the irradiation has been studied. We discuss the usefulness and limitations of effective model Hamiltonians, the role of the intramolecular vibrational redistibution (IVR) and symmetry-breaking features of the motion at short and long time scales.

[1] M. Lewerenz and M. Quack, *J. Chem. Phys.*, 88: 5408-5432 (1988); R. Marquardt and M. Quack, *to be published.*
[2] H. Hollenstein, R. Marquardt, M. Quack and M.A. Suhm, *J. Chem. Phys.*, 101: 3588-3602 (1994).
[3] M. Quack, *J. Chem. Phys.*, 69: 1282-1307 (1978).
[4] R. Marquardt, M. Quack and J. Stohner, URIMIR Program package, *to be published in QCPE.*

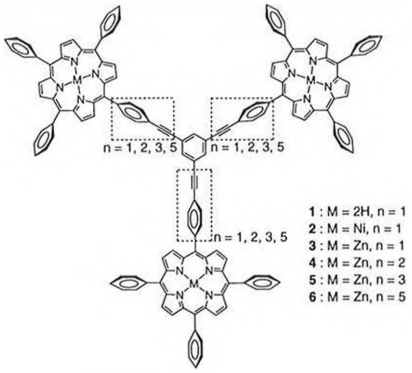
Physical chemistry **177**

Investigation of the dynamics of energy transfer in multiporphyrin arrays

Pierre Brodard#, Claudia Högemann#, Eric Vauthey#, Olivier Mongin§, Cyril Papamicael§, Albert Gossauer§

Institute of Physical Chemistry of the University of Fribourg,
§ Institute of Organic Chemistry of the University of Fribourg,
Pérolles, CH-1700 Fribourg, Switzerland

The dynamics of intramolecular electronic energy transfer (EET) in several triporphyrins arrays, which can be viewed as synthetic models of natural light harvesting systems, has been investigated using the picosecond polarisation grating technique. This method allows the reorientational dynamics of the transition dipole for absorption to be determined. In these arrays, such a reorientation can take place by both intramolecular EET and rotational diffusion of the whole molecule, the former being in principle independent on solvent viscosity.
The dependence of the EET rate constant on both the spacer length and M has been studied. The mechanism for EET, through space (Förster) or through bond, will be discussed.



Physical Chemistry **178**

Competition between triplet-triplet energy transfer and electron transfer in the quenching of aromatic ketones in the triplet state

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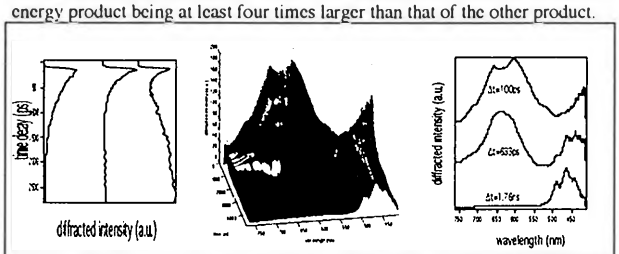
The competition between electron transfer (ET) and triplet energy transfer (TT) in the quenching of benzophenone, xanthone and anthraquinone in the triplet state by molecules with both a sufficiently small oxidation potential and low triplet state was investigated in the picosecond to microsecond timescales. In the longer timescale, the product distribution depends strongly on the relative exergonicity of ET and TT processes, the yield of the lower energy product being at least four times larger than that of the other product.



Middle: 3D-TG spectrum of xanthone (XA) with 1-methoxynaphthalene (MN) in acetonitrile; *right*: 3XA* (top) undergoes ET (middle), the resulting ion pair undergoes back ET to XA + 3MN* (bottom); this mechanism is confirmed by the kinetics (*left*).

Picosecond transient grating (TG) measurements reveal that if TT is more exergonic than ET, the TT product is predominantly formed by two sequential ET reactions, i.e. by spin allowed back ET within the triplet geminate ion pair formed upon ET quenching (see Figure). However, if ET is more exergonic than TT, no conversion from the TT product to the ET product could be detected. In this case, the product distribution in the microsecond timescale seems to reflect the competition between the two processes. When both processes are exergonic, ET appeared to be always faster than TT. This is in agreement with the severe orbital overlap requirement for TT via the Dexter exchange mechanism.

Physical Chemistry **179**

Methyl Viologen in the Channels of Zeolite L

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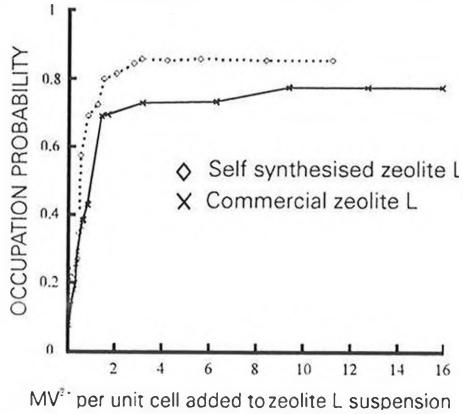
The degree of exchange of methyl viologen (MV^{2+}) [1] within the channels of two zeolite L samples [2] was determined very carefully as a function of the amount of MV^{2+} added to the zeolite. The values for maximum occupation probability are .78 and .85 MV^{2+} per unit cell. The IR and Raman spectra for various occupation probability values were obtained. Below shows the occupation probability of the MV^{2+} in the zeolite versus the amount of methyl viologen added to the zeolite L suspension.



[1] O. Poizat, C. Sourisseau, Y. Mathey, *J. Chem. Soc., Faraday Trans.* **1984**, *80*, 3257
[2] N. Gfeller, S. Megelski, G. Calzaferri, *J.Phys.Chem.***1998**, *102*, 2433

Physical Chemistry **180**

Resorufin in the Channels of Zeolite L
Exit Kinetics Monitored by Fluorescence Spectroscopy

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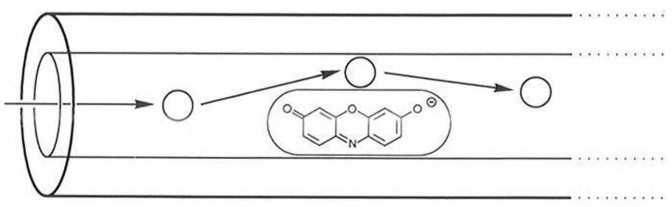
University of Bern, Freiestrasse 3, CH-3012 Bern

The fluorescence of the resorufin anion is quenched inside the channels of zeolite L. It is therefore possible to investigate the exit kinetics of the intercalated resorufin molecules. We observed that the exit process is initiated by solvent molecules which enter the zeolite channels and displace the resorufin molecules irreversibly. The following series was found for the displacement rate: water ≫ methanol > ethanol > 1-propanol ≳ 1-butanol (no displacement). For solvent molecules which are small enough to pass the resorufin molecules inside the channels easily (see figure below), a homogeneous Markoff chain can be used to discuss the exit kinetics.[1]



[1] D.Brühwiler, N.Gfeller, G.Calzaferri, *J. Phys. Chem. B* **1998**, *102*, 2923.

Physical Chemistry **181**

Hydrogen bonding and vibrations of 6–hydroxyquinoline·H_2O in the S_0 and S_1 states

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Universität Bern, CH–3012 Bern, Switzerland

6–Hydroxyquinoline (6HQ) can act either as an H–bond donor at the O–H group or as an acceptor (at the N atom). Furthermore, S_1 excited–state proton transfer (ESPT) from 6HQ to H_2O occurs adiabatically in aqueous solution.[1] We have investigated clusters of 6HQ with various solvent molecules as model systems for ESPT in clusters. Two different rotamers of 6HQ exist with the O–H bond in *cis* and *trans* position relative to the quinoline frame. Using Hartree-Fock (HF) calculations with the 6–31G(*d,p*) basis set fully energy-minimized structures were computed for (a) both the *cis*– and *trans*–6HQ·H_2O complexes and (b) the lowest–energy torsional transition structure. Harmonic vibrational analyses was carried out at these stationary points with focus on the intermolecular modes. $S_1 \leftarrow S_0$ vibronic spectra were measured using two–color resonant two–photon ionization spectroscopy. Bands belonging to the *cis*– and *trans*– rotamers were unequivocally identified via spectral holeburning. Following identification of both *cis* and *trans* electronic origins, dispersed fluorescence emission spectra of 6HQ·H_2O were measured. A detailed assignment of the bands in the inter– and intramolecular frequency range is given. The results are consistent with the H_2O bonded exclusively to the hydroxyl–group. No evidence for *keto–enol* tautomerization or for proton transfer was found in this complex.

[1] E. Bardez, A. Chatelain, B. Larrey and B. Valeur, *J. Phys. Chem* **98**, 2357 (1994)

Physical Chemistry **182**

Torsional Excitations of the 2-Hydroxypyridine • NH_3 complex: A spectroscopic and theoretical study

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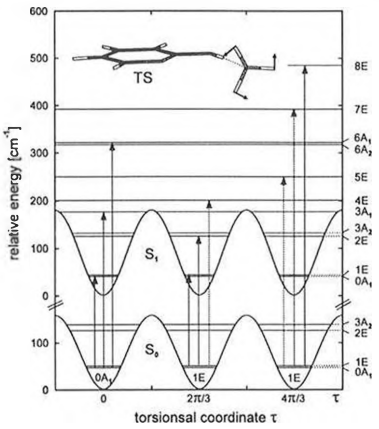
The hydrogen-bonded 2-hydroxypyridine • NH_3 (2-HOP • NH_3) complex were produced and cooled in supersonic beams. Investigation of the vibrational and torsional structure of this complex in its electronic ground and excited state were made by laser spectroscopic experiments as well as theoretical studies using *ab initio* techniques, including CIS calculations for the S_1 state.

Cyclic potentials for the torsional motion of the NH_3 molecule relative to the 2-hydroxypyridine frame were determined for both electronic states including torsional barriers and level structure.

The calculated torsional transitions were observed in the resonant two-photon ionization spectra for both isotopomers 2-HOP • NH_3 and 2-DOP • ND_3 .



Physical Chemistry **183**

Conformers and Isomers of the Water Hexamer

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Ab initio structure optimizations were performed for the cyclic and cage-type water hexamer at the *MP2/aug-cc-pVDZ* level. For the cyclic water hexamer, the minimum energy structure is a cyclohexane-type *chair* conformer. The analogous *boat* conformer of water hexamer is a local minimum, while the *twist* conformer is not a stationary point. The "planar" C_{6h} symmetric structure is a stationary point with high Hessian index, and further local minima and saddle points were found. The resulting torsional interconversion potential energy surface is complex. The *chair*↔*boat* interconversion pathways show many differences relative to cyclohexane. A *cage*-type structure was optimized at the *MP2/aug-cc-pVDZ* level, corresponding to the *(ud)[1]*-structure of Gregory and Clary [1]. This isomer is ≈1.6 kcal/mol more stable, but this difference is reduced by the relative zero-point energies, rendering both structures energetically competitive.

[1] D. Clary, J. K. Gregory, J. Phys. Chem. A **101**, 6813-6819 (1997).

Physical Chemistry **184**

Transfer of electronic excitation energy between dye molecules in the channels of zeolite L

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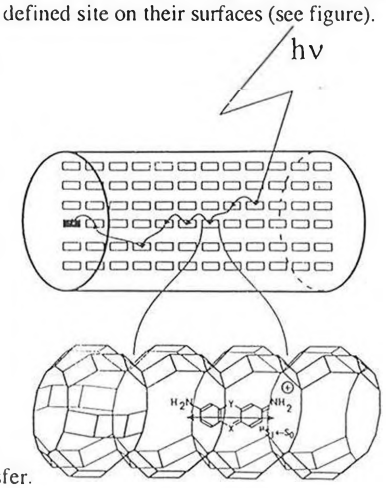
University of Bern, Freiestrasse 3, CH-3000 Bern 9,

The intercalation of appropriate dyes into zeolites leads to highly anisotropic arrangements in which the dye molecules are present as monomers up to very high concentrations. Fluorescent dyes thus help to create organized systems which absorb light within the volume of microcrystals and are able to transport excitation energy to a defined site on their surfaces (see figure).

We show that the intercalation of the two cationic dyes pyronine (X=C-H, Y=O) and oxonine (X=N, Y=O), which penetrate the cylinders from the bottom and the top surface, into the channels of zeolite L can be observed with the fluorescence microscope.

Both dyes are absorbed from an aqueous solution with about the same rate and high dye concentrations in zeolite are reached. This leads to short distances between the molecules, which allows very fast energy migration and energy transfer.



N.Gfeller, S.Megelski, G.Calzaferri, *J.Phys.Chem.B* **1998**,102, 2433

Physical Chemistry **185**

Hydrodechlorination of CFC-12 (CCl_2F_2) on Sol-Gel Derived Pd/Al_2O_3 Catalysts

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Chlorofluorocarbons (CFCs) are widely used in consumer and industrial applications [1]. However, their contribution to ozone depletion forced the reduction on their production and use. The recovery of CFCs and particularly their transformation to harmless and preferably useful chemicals was considered an economically better alternative than their complete destruction. Presently the most promising route for this transformation is hydrodechlorination of CFCs to the corresponding hydrofluorocarbons (HFCs) by the reaction below. There are several investigations on the hydrodechlorination of CFCs over supported metal catalysts such as Pd on Al_2O_3 [2], AlF_3 [3], and carbon [4]. It has been reported [2][3][4] that the metal and alumina support undergo changes during the reaction, e.g., Pd to PdC and/or Al_2O_3 to AlF_3. However, the effect of these changes in determining the product selectivity is not yet clearly understood.

In this study, the hydrodechlorination of CCl_2F_2 on 5 wt% Pd/Al_2O_3 prepared by sol-gel route was investigated. Characterization of fresh and spent catalysts has been carried out to examine the changes of the catalyst surface during the reaction and to correlate those changes with the catalytic activity and, in particular, with the product distribution.

$$CCl_2F_2 + H_2 \longrightarrow \text{products } (CH_2F_2 \text{ is the desired product})$$

[1] L.E. Manzer and V.A. Rao, *Adv. Catal.*, **1993**, *39*, 329.
[2] W. Juszczyk, A. Malinowski, and Z. Karpinski, *Appl. Catal.*, A, **1998**, *166*, 311.
[3] B. Coq, F. Figuéras, S. Hub, and D. Tournigant, *J. Phys. Chem.* **1995**, *99*, 11159.
[4] E.J.A.X. van de Sandt, A. Wiersma, M. Makkee, H. van Bekkum, and J.A. Moulijin, *Catal. Today*, **1997**, *35*, 163.

Physical Chemistry **186**

Reactivity of Nitrogen Containing Organic Intermediates in the Selective Catalytic Reduction of NO_x with Organic Compounds

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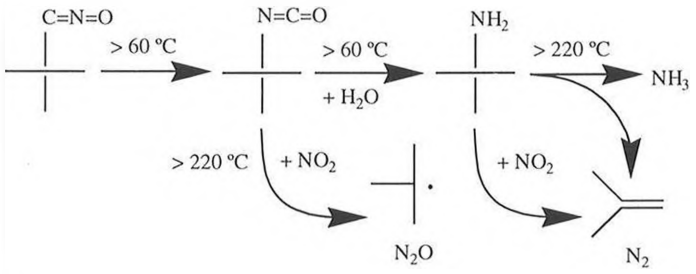
Laboratorium für Technische Chemie, ETH-Zentrum, CH-8092 Zürich

One of the most challenging targets in exhaust gas catalysis is the design of catalytic systems which are capable of removing NO_x under lean gas conditions (air/fuel ratio > 1). Therefore the reactivity of different nitrogen-containing compounds, which may be formed as intermediates during the selective catalytic reduction of NO_x with organic compounds over alumina (HC-SCR), has been investigated in the temperature range of 60 – 610 °C. ^{t}BuCNO, ^{t}BuNCO and ^{t}BuCN were used as model compounds. The reactivity tests comprised the decomposition and oxidation reactions in a stream of O_2 and N_2, and in mixtures of NO or NO_2 with O_2. These studies revealed that ^{t}BuCNO isomerizes readily to ^{t}BuNCO and then decomposes to CO_2 and ^{t}BuNH$_2$. The latter rapidly reacts with NO_2 to form N_2 or further decomposes into isobutene and NH_3, which may be followed by conventional SCR with NH_3 as a reducing agent. This indicates that a reaction sequence from ^{t}BuCNO to N_2 is likely.



Physical Chemistry **187**

Gold Catalysts for Low Temperature CO Oxidation: Towards a Better Understanding of the Gold/Metal Oxide Interface

J.-D. Grunwaldt, P. Fabrizioli, M. Maciejewski, C. Wögerbauer, A. Baiker

Laboratorium für Technische Chemie, ETH Zentrum, CH-8092 Zürich

Highly dispersed gold on specific metal oxide supports exhibits remarkable activity in the oxidation of carbon monoxide at low temperatures [1,2], although the metal oxide support and bulk gold are almost inactive. Recently, we have succeeded in immobilizing small gold particles on different supports via gold colloids [3]. The final particle size is mainly established before deposition by the size of the gold colloids. Hence, this synthesis strategy allows to get further insight into the role of the gold/oxide interface because the gold particle size is hardly dependent on the support.

The catalytic activity in CO oxidation was investigated in micro-reactors taking dried and calcined Au/TiO_2 and Au/ZrO_2 catalysts. We have found that the Au/TiO_2 catalysts are more active than the Au/ZrO_2 catalysts despite the similar gold particle size. Also the dried (uncalcined) Au/TiO_2 catalyst was active at room temperature. Water strongly inhibits the low temperature CO oxidation. The structure, chemical composition and chemisorptive properties were investigated in further detail with various methods (HRTEM, XRD, DRIFTS, XPS, ISS and pulse thermal analysis). From these results we concluded that not the adsorption of CO, but that of O_2 is the crucial step in the low temperature CO oxidation. The role of adsorbed oxygen and the interplay of the oxide support and the small gold particles will be discussed.

[1] M. Haruta, Catal. Today **1997**, *36*, 153.
[2] A. Knell, P. Barnickel, A. Baiker, A. Wokaun, J. Catal. **1992**, *137*, 306.
[3] J.-D. Grunwaldt, C. Kiener, C. Wögerbauer, A. Baiker, J. Catal., submitted.

Physical Chemistry **188**

EXCITED-STATE DYNAMICS OF RADICAL IONS IN THE CONDENSED PHASE USING THE PICOSECOND TRANSIENT GRATING TECHNIQUE

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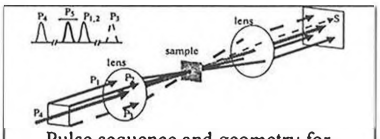
Université de Fribourg, Institut de chimie physique, Pérolles, 1700 Fribourg

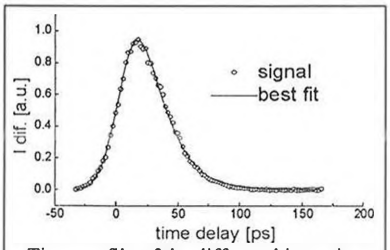
The transient grating (TG) technique has proven to be a powerful tool to study reaction dynamics. This method has been used to study the excited-state lifetime of perylene (Pe) radical ions in acetonitrile and in a boric acid glass.



Pulse sequence and geometry for transient grating experiment with ions generated by photoinduced electron transfer

When investigating species with a small extinction coefficient, such as anthraquinone radical anion, higher pumping intensities are required. Consequently, the TG signal also contains a contribution due to optical Kerr effect (OKE). To eliminate it, a new probing pulse sequence, which is only sensitive to population changes, has been developed. In this case, the density grating, caused by the thermal expansion following the nonradiative deactivation of the excited species, is probed after the decay of both OKE and population gratings.

The excited radical ions studied so far have a lifetime of less than 15 ps in solution, the response time of our setup. For $Pe^{\bullet+}$ in a boric acid glass the excited lifetime was found to be 35 ps.



Time profile of the diffracted intensity measured at 532 nm with $Pe^{\bullet+}$ in boric acid glass

Gumy, J-C., Vauthey, E. *J. Phys. Chem. A* **1997**, *101*, 8575

Physikalische Chemie **189**

Untersuchung von Elektroden für Lithium-Ionen-Batterien mit Potentialsprungmessungen

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Paul Scherrer Institut, Allgemeine Energieforschung, Elektrochemie, CH - 5232 Villigen PSI

Ein Potentialsprungexperiment an einer Elektrode für eine Lithium-Ionen-Batterie liefert eine Strom-Zeit - Kurve (Fig.1), die von der Systemdynamik bestimmt wird und grob mit einem mittleren Diffusionskoeffizienten beschrieben werden kann. Diese Diffusionskonstante ist bestimmt durch die Diffusion der Ionen im Festkörper und Elektrolyten, sowie den Elektronentransferprozess. Bei kleiner Überspannung kann der geschwindigkeitbestimmende Schritt jedoch der Elektronentransferprozess in der Aktivmasse sein. Für die Experimente wurde als Beispiel die positive Elektrode gewählt. Sie besteht aus einer Mischung von $LiMn_2O_4$ und Leitfähigkeitsruss, wovon das $LiMn_2O_4$ wie folgt reagiert:

$$LiMn_2O_4 \underset{\text{Einlagern}}{\overset{\text{Auslagern}}{\rightleftharpoons}} x\,Li^+ + x\,e^- + Li_{1-x}Mn_2O_4$$

Dieser Vorgang findet bei etwa 4 V vs. Li/Li^+ statt (Fig.2). Auf dem Poster wird der Einfluss der $LiMn_2O_4$ Teilchengrösse und der Dicke der Elektrode diskutiert.

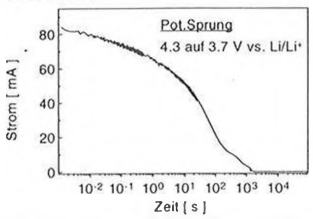

Fig. 1: Strom-Zeit Kurve einer $LiMn_2O_4$-Elektrode.

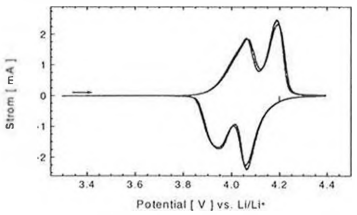

Fig. 2: Zyklovoltammogramm einer $LiMn_2O_4$-Elektrode bei 50 µV/s.

Physical Chemistry **190**

β-cyclodextrin : A nanoporous solid characterised by adsorption and immersions techniques

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β- cyclodextrin is used in GC and HPLC because it can form host-guest inclusion complexes. The CD complexation processes are highly stereoselective and can be considered as a suitable method for the resolution of various isomers - structural, geometric, diastereometric and enantiomeric separations.

It was interesting to consider β-cyclodextrin as a nanoporous solid and to characterise it by immersion and adsorption techniques [1]. This approach provides information on the host-guest interactions and on the filling of the microporous cavity. However, in many cases, adsorption measurements are difficult and slow, owing to restricted entry into the cavity. This is the case for water, which forms a protective cover at the entrance through hydrogen bonding. Water itself can also block the entry of other vapours.

Immersion of β-cyclodextrin into acetonitrile led to an energy of - 3.66 J g^{-1} of solid. On the other hand, the adsorption of acetonitrile vapour, which is relatively easy, indicates that the cavity can only accommodate two molecules, instead of three, as suggested by calculations based on the volume of the cavity and the molecular volume of acetonitrile. Consequently, one obtains an interaction energy of -2.03 kJ mol^{-1} of acetonitrile with cyclodextrin when transfered from the liquid, or – 34.78 kJ mol^{-1} from the vapour phase.

Such data can be compared with theoretical predictions based on molecular mechanics.

[1] F. Stoeckli, in *Porosity in Carbons*, chap. 3, Edward Arnold, London (1995).

Physical Chemistry **191**

Binary adsorption of vapours from miscible or immiscible liquids in active carbons

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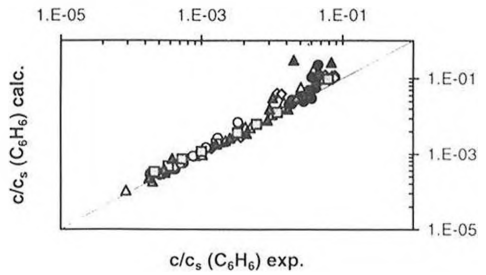
To describe the binary adsorption by microporous solids, we have extended the model of Dubinin, initially only valid for the adsorption of single vapours. We have shown recently [1] that the adsorption of miscible compounds can be predicted by integrating the theory of Myers-Prausnitz. This approach is no longer valid when the compounds are immiscible in the liquid state. For this case, we propose a new model, assuming independent co-adsorption[2]. It has been applied to the adsorption of water + benzene vapors by a typical active carbon at 293 K. Good agreement is found between the experimental and calculated values for the relative concentration of benzene in the gas phase.



[1] F. Stoeckli, D. Wintgens, A. Lavanchy and M. Stöckli, *Adsorp. Sci. Technol.*, **1997**, 15, 677.

[2] A. Lavanchy and F. Stoeckli, *Carbon*, **1998** (in press).

Physical Chemistry **192**

A Dubinin, Raduskevich and Kaganer Standard Isotherm for External Surfaces of Carbons

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Active carbons are characterised by their micropore volume and by an external surface area S_e. Various techniques can be used to assess this area. In Dubinin's t/F method [1], a reference isotherm γ is considered for C_6H_6 at 293K, where A = RT $\ln(p_s/p)$, and $p/p_s < 0.1$. The experimental adsorption isotherm for benzene is the sum of the classical Dubinin-Radushkevich (DR) or Dubinin-Astakhov (DA) equations and a contribution from S_e

$$\gamma = 9.16 \cdot 10^{-3} \exp[\,A/6.35\ kJmol^{-1}\,] \qquad N_a = N_{a0} \exp[(A/E_0)^2] + S_e\,\gamma$$

Relatively good results have been obtained using this method to determine S_e, but there are several inconsistencies. Rather than the expression for γ used in Dubinin's t/F method, we suggest [2] that S_e can be estimated using a standard isotherm of the Dubinin, Radushkevich and Kaganer (DRK) type for C_6H_6

$$\gamma' = 3.86 \cdot 10^{-3} \exp[\,(A/11\ kJmol^{-1})^2\,]$$

The new expression fulfils the requirement for temperature invariance of the characteristic energy E_0, and uses the exponent n=2 of the DRK equation. This modification correlates adsorption in micropores and on the external surface within the framework of Dubinin's theory.

[1] M.M. Dubinin, *Carbon* **1989**, 27, 457.

[2] F. Stoeckli, D. Hugi-Cleary, T.A. Centeno, *J. Eur. Ceram. Soc.* **1998**, in press

Physical Chemistry **193**

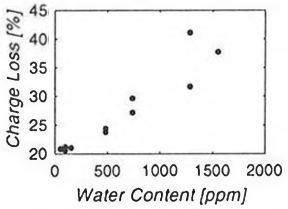
Influence of Water on the Charge Loss during the First Intercalation of Lithium into Graphite

Felix Joho[a], Beat Rykart[a], Roman Imhof[a], Petr Novák[a], Michael E. Spahr[b], Alain Monnier[b]

[a]Paul Scherrer Institute, Electrochemistry Section, CH-5232 Villigen PSI
[b]Timcal AG, CH-5643 Sins

Lithium-ion batteries with high energy density and good cycleability usually consist of a carbon-based negative electrode, a positive lithium metal oxide electrode, and a separator soaked with organic electrolyte. However, the rather high irreversible charge loss occurring during the first charging of carbon electrodes is still a challenge. It is generally accepted that this charge loss is mainly due to the reductive decomposition of the electrolyte on the negative electrode. The resulting protective film called solid electrolyte interphase (SEI) allows lithium-ion transfer but prevents electron transfer. The SEI formation mechanism is rather complex and is not yet completely understood. In this work the influence of different amounts of water in the electrolyte on the SEI formation is studied in electrolytes based on ethylene carbonate (EC) and dimethyl carbonate (DMC).

In a dry electrolyte (≈8 ppm H_2O) we have measured a charge loss of ca. 20 % in the first cycle for the graphite Timrex SFG 6 (BET: 15 m^2/g), whose SEI formation is more pronounced than in other SFG-graphites. This value rises gradually, if the water content increases (Fig.). Although it is possible to cycle graphite electrodes in electrolytes with a relatively high water content (up to at least 1500 ppm), the charge loss of the first cycle and the possibility of a cell failure increases with a higher water content.



In Li/LiClO$_4$ DMC&EC/ graphite (Timrex SFG 6) cells the charge loss during the first cycle increases with a higher water content in the electrolyte.

Support from the Swiss Federal Office of Energy is gratefully acknowledged.

Physical Chemistry **194**

Oxidative Electrolyte Solvent Degradation in Lithium-Ion Batteries

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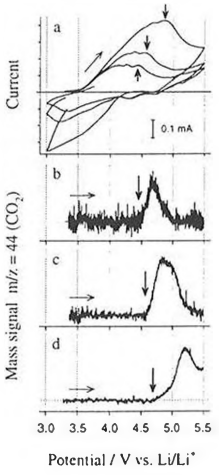
In order to improve our understanding of the degradation paths of electrolyte solvents at real lithium ion battery electrodes we report on the results of our investigations of the oxidative decomposition of organic carbonate electrolyte solvents at lithium metal oxide composite electrodes. $LiNiO_2$, $LiCoO_2$, and $LiMn_2O_4$ have been studied by in-situ differential electrochemical mass spectrometry (DEMS) in combination with two different electrolyte solutions, propylene carbonate (PC) and a 1:1 v/v mixture of ethylene carbonate / dimethylcarbonate, both with 1 M $LiN(SO_2CF_3)_2$.

We observed that both types of electrolyte solutions decompose to form CO_2 at potentials positive to lithium de-intercalation. The figure shows an experiment with PC / 1 M $LiN(SO_2CF_3)_2$ and a $LiNiO_2$ composite electrode. Part (a) shows the cyclic voltammograms at scan rates of 0.1, 0.2, and 0.4 mV/s. The figure also shows the corresponding potential dependence of the mass signal m/z = 44, representing CO_2, for scan rates of (b) 0.1 mV/s, (c) 0.2 mV/s, and (d) 0.4 mV/s. The starting point of the CO_2 evolution shifts up to several hundred mV depending on the scan rate and correlates well with the occurrence of the third weak current peak in the cyclic voltammograms (indicated by arrows). We interpret this behavior as being due to a chemical degradation reaction starting at the third anodic current peak.



Computational Chemistry **195**

Study of Bis(2,2,6,6-tetramethylheptane-3,5-dionato)Nickel(II) and the addition product with bipyridine using DFT

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Although the addition reaction of Bis(2,2,6,6-tetramethylheptane-3,5-dionato)Cobalt(II) ($Co(tmhd)_2$) with 2,2'-bipyridine (bpy) is well known [1], the interpretation of the reaction of the $Ni(tmhd)_2$ with bpy in the gas phase is still unresolved [1]. In this work a theoretical approach of $Ni(tmhd)_2$ and then of its interaction with a bpy ligand, using the Amsterdam Density Functional (ADF) program package is presented.
The geometry of the $Ni(tmhd)_2$ complex has been optimized using the local density approximation (LDA). We found that the D_{2h} symmetry (square planar) lies lower in energy than the complex in its D_{2d} symmetry (tetrahedral), which is in good agreement with the X-ray structure [2].
Furtheron we studied the interaction of the $Ni(tmhd)_2$ with bpy in comparison with the interaction of the $Ni(tmhd)_2$ with (1,1,4,4-tetramethyl)-ethylenediamine, the latter being well known in the gas phase.

[1] P.Chassot, in "Le complexe du Co(tétraméthylheptanedionate)$_2$ avec le 2,2'-Bipyridyl, sa formation en phase gazeuse et en solution", Thèse n° 1115, Université de Fribourg, 1995.
[2] F.A.Cotton, J.J.Wise, Inorg.Chem. **5(7)**, 1200-1207 (1966)

Computational Chemistry **196**

Magneto-Structural Analysis of Exchange Interaction in the biverdazyl Diradical

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The magnetic properties of 1,1',5,5'-Tetramethyl-6,6'-dioxo-3,3'-biverdazyl diradical (BVD) have already been experimentally investigated through EPR spectroscopy in frozen solution and in crystals [1]. We report a density functional (DF) study of the magnetic properties of the BVD both in vacuum and in solution. Solvent effects on the structure and magnetic properties have been evaluated using a recent implementation of the Polarizable Continuum Model (PCM) [2]. The effect of the inclusion of HF exact exchange through mixed functional (i.e. B3LYP) was also considered. In order to get the relative energy of the different spin states, the Broken Symmetry (BS) [3] spin projection technique was applied. A correction for the overlap between magnetic orbitals [4] has also been included. The nice agreement between computed and experimental exchange coupling values offers a further proof of the capability of the method to investigate the magnetic properties of molecular systems in solution.

[1] D. J. R. Brook, H. H. Fox, V. Lynch, M. A. Fox, *J. Phys. Chem.* **1996**, 100, 2066.
[2] M. Cossi, V. Barone, R. Cammi, J. Tomasi, *Chem. Phys. Lett.* **1996** 225, 327.
[3] L. Noodleman, J. G. Norman, *J. Chem. Phys.* **1979**, 70, 4903.
[4] A. Ovchinnikov, J. K. Labanowski, *Phys. Rev. A* **1996**, 53 3496.

Computational Chemistry **197**

First Principles Modelling of Lithium Intercalation into Graphite and Manganese Oxide for Electrodes : Where is the « bottle neck » ?

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In the design process of new electrode materials for lithium intercalation batteries, the energy density is one of the target property. But for commercially attractive devices, the typical recharging time is a limiting problem, although the energetical performances are acceptable.

We present here a method based on first principles calculations (both with the full crystallographic symmetry and in the cluster approximation) which allows us to describe the main features of the dynamical processes that occur in the intercalation process (surface insertion and bulk diffusion) in terms of energy barriers. These calculations are very useful to material designers when analysing the rate determining processes.

An illustration of this method is shown for the case of graphite and manganese dioxide intercalation, which are promising candidates for resp. anodic and cathodic materials for lithium ion batteries.

Computational Chemistry **198**

A KSCED-DFT Study of the Physisorption of CO on the MgO(100) and ZnO($10\bar{1}0$) Surfaces

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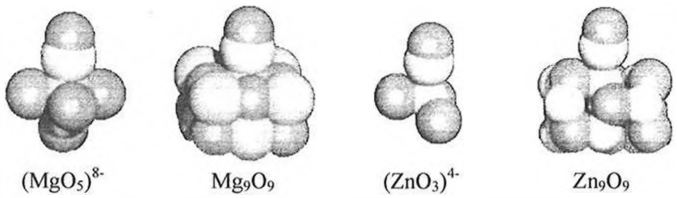
The structure and streching frequency of the CO molecule physisorbed vertically on the MgO(100) [1] and ZnO($10\bar{1}0$) surfaces have been investigated using density functional theory (DFT) within the recently developed formalism of Kohn-Sham equations with constrained electron density (KSCED) [2]. The surfaces were represented using several model clusters [$(MgO_5)^{8-}$, Mg_9O_9, $(ZnO_3)^{4-}$ and Zn_9O_9] embedded in a matrix of point charges.



The results show very good agreement with experiment as far as the adsorption energies and vibrational frequencies are concerned.

[1] T.A. Wesolowski, N. Vulliermet, J. Weber, *J. Mol. Struct., Theochem.*, in press
[2] T.A. Wesolowski, J. Weber, *Chem. Phys. Lett.*, **1996**, 248, 71-76

Computational Chemistry **199**

In Search of New Hydroamination Catalysts: Static and Dynamic *Ab Initio* DFT Studies

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Laboratory of Inorganic Chemistry, CH-8092 Zürich
[‡] IBM Research Division, Zurich Research Laboratory,
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Using density functional theory, we have investigated d^8 transition metal complexes in view of their potential application as catalysts for the **hydroamination of alkenes** [1]. We used the **projector-augmented wave (PAW) method** [2], a plane-wave-based method with all-electron wavefunctions capable of performing **Car–Parrinello *ab initio* molecular dynamics** simulations.

Transition states were located using friction dynamics combined with a moving constraint to drive the system over the barrier, while all other degrees of freedom were being relaxed. Dynamical reaction paths could then be obtained by letting the system evolve freely from the transition states, thus allowing a detailed analysis of the time evolution of the reaction event [3].

Two catalytic pathways have been explored: (*a*) External nucleophilic attack of an amine on the coordinated alkene (C=C activation), followed by protonolytic cleavage of the formed metal–carbon bond; (*b*) activation of the N–H bond by oxidative addition of the amine, yielding an amido-hydrido complex, with subsequent alkene insertion and reductive elimination. Complexes of the type $\{MCl(PH_3)_2\}^{+,0}$, where M = Ni(II), Pd(II), Pt(II) or Co(I), Rh(I), Ir(I), have been studied. For Ni(II), the external attack pathway is favoured over N–H activation, the rate-determining step being the solvent-mediated protonolysis with a barrier of 110 kJ mol^{-1}. N–H activation, on the other hand, is much easier with Ir(I).

[1] For a review, see: T. E. Müller, M. Beller, *Chem. Rev.* **1998**, *98*, 675–703.
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[3] P. E. Blöchl, H. M. Senn, A. Togni, in *Transition-State Modeling for Catalysis*, eds. D. G. Truhlar, K. Morokuma; ACS, Washington, D.C., 1998; ACS Symposium Series; *in press*.

Computational Chemistry **200**

Density Functional Study of the Protonated, Acetylated and Mercurated Derivatives of Ferrocene: Mechanism of Electrophilic Substitution Reaction

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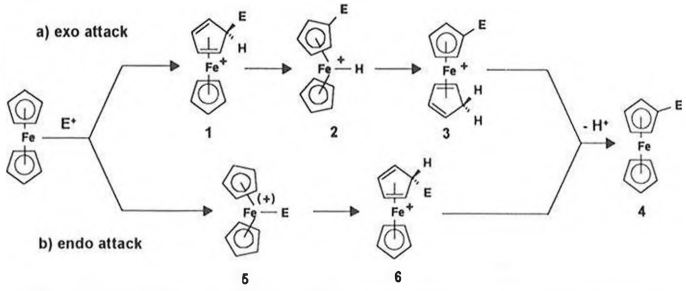
The mechanism of electrophilic substitution reaction of ferrocene has been investigated using density functional theory. In particular, reactions with two hard electrophiles (protonation and acetylation) and one soft electrophile (mercuration) have been studied at the LDA and B-PW91 levels of theory using a triple-ζ STO basis set. The results allow to rationalize the different exo versus endo mechanisms depending on the nature of the electrophile.



General mechanism of electrophilic substitution reaction of ferrocene.

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Computational Chemistry **201**

DENSITY FUNCTIONAL THEORY INVESTIGATION OF THE $C_7H_{11}^+$ POTENTIAL ENERGY HYPERSURFACE AND ITS COMPARISON WITH POST HARTREE-FOCK RESULTS

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The theoretical study of the $C_7H_{11}^+$ potential energy hypersurface lead to the location of minima such as boat and chair cyclopropyl carbinyl or allyl types of cations.

An extensive investigation of this surface was achieved by the characterization of electronic structures, charges, and relative stabilities of the equilibrium geometries and transition states using the density functional B3LYP methods. The reaction pathways connecting minima and transition states were also investigated by means of following mass-weighted internal coordinates. B3LYP methods take into account the electron correlation and are reputed to give good results for organic molecules. The quality of these results is comparable to those obtained with MP2 *ab initio* methods and certainly require much fewer computer resource. The portion of energy devoted to the electron correlation plays an important role for the carbocations studied in this work.

Along these lines, a comparison between B3LYP and MP2 results will be provided. The critical case of the bicyclobutonium cation, which is the key intermediate on this surface, will also be discussed.

Some substitution effects on the relative stabilities of the different minima were also studied and will be presented.

Chimie Computationelle **202**

Calculating Magnetic Coupling Parameters Using Density Functional Theory

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There is currently considerable interest in the calculation of magnetic coupling parameters; this holds for both NMR and ESR. This brought us to the development of our own program to access, through density functional calculations, these observables, concentrating at first hand on the *g*- and *A*-tensors from EPR-spectroscopy. Our approach to the problem is characterised by second-order perturbation theory treatment on the electronic structure calculations resulting from the ADF program package. Further, for the numerical evaluation of both one- and two-electron integrals, an integration scheme developed by one of the authors, is used [1], reducing to a high amount the number of integration point, and thus computing time, needed.

The expression for the *g*-tensors may be cast in the following form (restricted case) :

$$g_{\mu\nu} = g_e\delta_{\mu\nu} + g_e \sum_{m(\neq n)} \sum_{N} \sum_{N'} \frac{\left\langle \phi_n^N \middle| \xi_N\left(r^N\right) L_\mu^N \middle| \phi_m^N \right\rangle \left\langle \psi_m \middle| L_\nu^{N'} \middle| \phi_n^{N'} \right\rangle}{\varepsilon_n - \varepsilon_m}.$$

Preliminary results, based on this approach, will be presented.

[1] C. Daul, S. Daul, *Int. J. Quant. Chem.*, **1997**, *61*, 579

Computational Chemistry **203**

THEORETICAL INVESTIGATION OF THE MECHANISM OF WATER-EXCHANGE IN THE RHODIUM(III) HEXAAQUA ION: PRELIMINARY RESULTS

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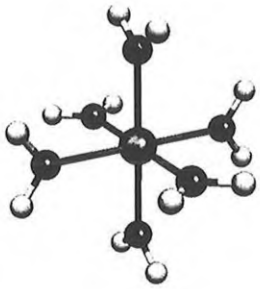
[2] Institut de Chimie Minérale et Analytique, Université de Lausanne, CH-1015 Lausanne
[3] Institut de Chimie Physique, Ecole Polytechnique Fédérale, CH-1015 Lausanne



The mechanism of water exchange in the first coordination sphere of the rhodium(III) hexaaqua ion has been investigated using the *ab initio* method at the Hartree-Fock and post-SCF levels. Reaction paths have been calculated for dissociative and associative mechanism using a model that involves the metal ion with six or seven water molecules [1].

The structure of the systems leading to stationary points on the potential energy surfaces (reactants/products, transition states and intermediates) have been characterized and analyzed in order to deduce thermodynamic and kinetic properties (such as the volume of activation) which are then compared with experimental values [2].

[1] F.-P. Rotzinger, *J. Am. Chem. Soc.* **1996**, *118*, 6760.
[2] A. Cusanelli, L. Nicula-Dadci, U. Frey and A.-E. Merbach, *CHIMIA* **1996**, *50*, 618.

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Analytical Chemistry **204**

ESI/MS FOR THE SELECTIVE DETERMINATION OF AROMATIC SULFONATES IN ENVIRONMENTAL SAMPLES

Marc J-F Suter, Sonja Riediker and Walter Giger

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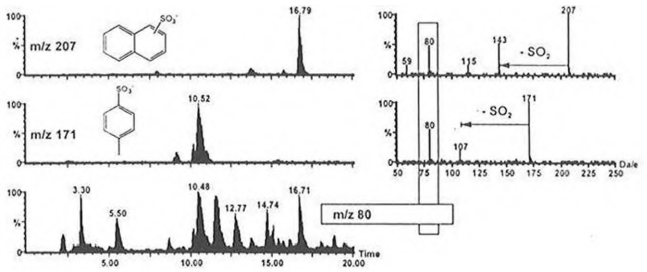
Aromatic sulfonates are intermediates for the synthesis of a lot of chemical products, such as azo dyes, herbicides, concrete plasticizers, and are applied in a wide variety of industrial processes. Aromatic sulfonates have been found in surface waters and landfill leachates.
They are known to form negatively charged SO_3-radicals (m/z 80), under negative CI, FAB, atmospheric pressure ionization with corona discharge and ESI.
We have found that the generation of SO_3-radicals from aromatic sulfonates can be induced on a benchtop LC/MS, fitted with an electrospray interface. Using this specific marker ion, environmental samples can easily be screened for sulfonated organic chemicals. Hence, this technique is ideally suited for the evaluation of the environmental impact of this kind of high volume chemicals.



Analytical Chemistry **205**

Determination of pyrrolizidine alkaloids in *Senecio* species by LC/MS and LC/NMR

Karine Ndjoko, Jean-Luc Wolfender and Kurt Hostettmann

Institut de Pharmacognosie et Phytochimie, Université de Lausanne, BEP, CH-1015 Lausanne, Switzerland

Rapid detection of natural products plays a strategic role in the phytochemical investigation of crude plant extracts. Combined techniques such as LC/UV, LC/MS and LC/MS/MS provide useful structural information on the metabolites on-line. In many cases, however, LC/UV and LC/MS are not sufficient to ascertain the structure of a compound on-line. The recent introduction of LC/NMR represents a powerful complement to LC/UV/MS screening.
Some pyrrolizidine alkaloids (PAs) isolated from the genus *Senecio* are well known for their carcinogenic, teratogenic, mutagenic and hepatotoxic properties. Rapid and sensitive methods were developed to determine and characterise the PA content in crude extracts.
On-line HPLC separation of PAs in *Senecio* species was performed using an alkaline acetonitrile-water gradient. The alkaloids present in the extracts were detected by thermospray LC/MS on a triple quadrupole instrument in the positive ion mode, allowing the determination of molecular weights. Specific fragments were observed by MS/MS experiments.
Since certain macrocyclic diester PAs adopt *cis/trans* configurations, complementary LC/NMR analyses were necessary to distinguish the isomeric structures. LC/NMR was performed in both on-flow and stopped-flow mode with acetonitrile-D_2O as well as methanol-D_2O as mobile phases. Good ^{1}H-NMR spectra were obtained for the different PAs in the stopped-flow mode. ^{1}H-^{1}H correlation spectra were also measured. LC/NMR data were particularly useful when LC/MS results appeared insufficient for an unambiguous peak identification and when reference substances were not available.

Analytische Chemie **206**

Beobachtung unbeabsichtigter Metallspeciestransformationen mittels angereicherter Quecksilberisotope und HPLC-ICP-MS

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Auf der Konferenz „Mercury as a Global Pollutant", am 4. bis 8. August 1996 in Hamburg, berichteten Wissenschaftler erstmals über die künstliche Bildung von Methylquecksilber während der Probenvorbereitung. In diesem Zusammenhang wurden auch die Werte des Methylquecksilbers von zertifizierten Standardreferenzmaterialien der EU und der IAEA in Frage gestellt. Diese zeigen Abweichungen von bis zu 46% des zertifizierten Methylquecksilber-Gehalts. Seit diesem Zeitpunkt rückte die Frage nach den Ursachen solcher ungewollter Speziestransformationen immer weiter in den Vordergrund. Mit Hilfe von angereicherten Quecksilberisotopen in Verbindung mit der ICP-MS-Spektroskopie können solche, für den Analytiker ungewollten Speziestransformationen untersucht und verfolgt werden. Mittlerweile wurde herausgefunden, dass sich eine artifizielle Bildung von Methylquecksilber hauptsächlich in Matrices zeigt, die mit Verbindungen oder Abbauprodukten des Pflanzenwachstums, insbesondere der von grünen Pflanzenteilen, in Verbindung stehen. Diese sind Sedimente, Böden, Moose, Tannen- und Fichtennadeln, Laubstreu und Blätter. Durch parallele Experimente mit Modellsubstanzen konnte herausgefunden werden, dass neben der Essigsäure insbesondere verzweigte Carbonsäuren als wesentliche Methyldonoren bei der Bildung von artifiziellem Methylquecksilber aus Hg^{2+} in Frage kommen können. Eine ausgeprägte Methylquecksilberbildung aus Hg^{2+} zeigten Carbonsäuren, die in alfa-Stellung zur Carboxylgruppe eine Methylgruppe besitzen. Es soll nun mit Hilfe von ^{13}C Markierungsexperimenten herausgefunden werden, welche Methylgruppe bei der Quecksilbermethylierung auf das Quecksilber übertragen wird. Diese Untersuchungen sind eine gute Basis um den Metall-Methylierungsmechanismus von Huminstoffe aufklären zu können.

Werner-Preisträger 1998 **207**

From Catalyst Design to Molecular Devices: Theory and Experiment

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Catalysis is perhaps the word which best describes the spirit of chemistry: the miracle of consumption and regeneration! The field of catalysis offers a unique playground to practice Chemistry in all its breadth: bioinorganic-, organometallic-, theoretical-, as well as combinatorial chemistry.

In a biomimetic spirit, the iron uptake and release from bifunctional siderophores was studied. In addition to shedding light on the iron release mechanism from enterobactin, these devices act as redox-triggered molecular switches.

To probe the role of the chirality at the metal in enantioselective catalysis, a configurationally stable, chiral-at-metal, three-legged piano stool complex was synthesized and tested for its catalytic properties.

To rationalize the unrivalled catalytic properties of d(0) bent metallocenes, the electronic driving force leading to the 'edge-bridged tetrahedral' geometry of $[MCp_2L_3]$ complexes are analyzed. This unusual geometry arises from a deformation along a reversed-*Berry* pathway and is found for all d(0) $[MD_2L_3]$ complexes (D = π-donor). These findings are corroborated with a structure-correlation analysis, allowing a mapping of the reversed-*Berry* pathway. The catalytic potential of $[MD_2L_3]$ complexes and their isolobal relationship to $[MCp_2L_3]$ will be emphasized.

Finally, the use of transition metal catalysts to generate solution phase libraries will be illustrated with a few examples.

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COLUMNA ANALYTICA

Column Editor: Prof. Renato Zenobi, ETH-Zürich

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ASMS 1998, May 31–June 4, Orlando, Florida

Personal impressions from Kathrin Breuker, Frédéric Dubois, Richard Knochenmuss, Edda Lehmann, and Renato Zenobi, Laboratorium für Organische Chemie, ETH-Zentrum, CH–8092 Zürich

Earlier this year, about 3000 people from all over the world gathered in Orlando, Florida, for the 46th annual meeting of the American Society for Mass Spectrometry (ASMS). The ASMS conference is one of the largest topical meetings, and is attracting an increasing number of scientists due to the rapidly growing use of mass spectrometry in many branches of chemistry, biology, and physics. The 1998 ASMS conference boasted six parallel oral sessions, seventeen workshops on special topics, and a large poster session that changed daily, with a total of *ca.* 1400 posters on display during the course of the conference. It is clear that it is difficult to digest this staggering amount of information, and our group was therefore present with several people to make sure not to miss anything important. Presented below are our 'personal favorites' among the contributions we heard or saw. Due to the nature of our own research, this report is biased towards laser-assisted mass spectrometry techniques; however, the scientific problems MS researchers are working on these days are investigated with every available method of modern mass spectrometry.

An 'earth-shattering breakthrough' in scientific research or technology was not present at this conference. The presentation that came closest was on the detection of very high-molecular weight DNA using matrix-assisted desorption/ionization (MALDI) at infrared (IR) laser wavelengths and using a liquid matrix. Traditionally, MALDI mass spectrometry has been performed with lasers emitting in the ultraviolet (UV) range; 337 nm from a nitrogen laser is typical. Matrix materials must efficiently absorb this wavelength, which can limit the range of useful compounds. In the last few years, there has been increasing interest in using infrared lasers, since all organic materials have absorption bands in this spectral region. The results of the recent burst of activity in this field were seen at the Orlando ASMS. The mass range attained with IR excitation was extended considerably: spectra of DNA with a molecular weight of 800000 Da were reported by *F. Hillenkamp*'s group, who have pioneered IR MALDI. The same group also compared IR MALDI with excitation pulses of 6, 100, and 185 ns duration. The first two lasers gave identical ion-pulse widths of 35 ns, the latter gave an 80-ns ion pulse. This is of both practical and theoretical interest, for choosing the laser and understanding the ionization mechanisms.

Wavelength selection is also important in IR MALDI, and 2.9 μm (Er:YAG laser) is popular since it is absorbed by OH and CH moieties. Some groups believe that the IR MALDI efficiency follows the matrix absorption spectrum (*R.C. Beavis*, *F. Hillenkamp*), others find this is not so (*R.S. Brown*). *R. Cramer* has found correlation with C=O absorption bands but not with those of OH or CH. Water ice is very attractive as a matrix since it could minimize sample preparation, but has proved difficult in spite of good 2.9-μm absorption. This year, *K. Murray* reported good results at –150° by mixing glycerol or ethanol into the solution using 2.7–2.9-μm excitation. MALDI with CO_2 lasers (10.1 μm) was reported last year by *Hillenkamp*. Proponents of IR MALDI have suggested that it is 'softer' than UV, producing fewer fragment ions, but otherwise gives comparable results and is thus perhaps the method of the future. It appears to give more highly charged ions than UV MALDI, which is not generally desirable, and uses sample much more quickly. Comparisons of UV and IR mass spectra this year do not permit a simple judgment that either is better, nor are the differences easily understood. It seems likely that ion-molecule reactions play a significant role in both cases, as suggested by observation of competition between proteins in UV and IR MALDI by *M. Karas*' group.

Mass spectrometry is starting to play a very important role in new branches of bioanalytical research. Besides molecular mass information, MS-based methods are also able to provide sequence and structural information. New ion dissociation techniques have been developed, among them SID (surface-induced dissociation) and ECD (electron-capture dissociation). For example, SID allows high-energy ion activation on a timescale of hundreds of femtoseconds, in contrast to the commonly applied collision-induced dissociation (CID). As shown in a poster by *W. Zhong*, *J.H. Futrell*, and coworkers, SID results in random fragmentation patterns rather than selective rearrangement reactions as commonly observed with CID. A lecture by

F.W. McLafferty discussed ECD, where an ion of higher charge state (*e.g.*, $[M + 3H]^{3+}$) is allowed to capture a low-energy electron, reducing its charge state by one. The energy of charge recombination is now available for dissociation of the resulting $[M + 3H]^{2+\cdot}$ ion. Applied to peptides and proteins, this technique yields *ca.* 90% sequence information for molecules of 10000 Da molecular weight.

Novel techniques are developed to gain insight into the tertiary structure of proteins. An interesting method to study this employs hydrogen/deuterium exchange (posters by the groups of *Y. Konishi*, *D.L. Smith*, or *D.H. Russell*). The protein or the complex is dissolved in a deuterated solvent and aliquots are taken after different times and measured in a mass spectrometer with isotopic resolution (often by *Fourier*-transform ion cyclotron resonance, FT-ICR). The rate of hydrogen exchange depends on the accessibility of the proton for the deuterated solvent. Protons situated in the interior of the folded protein will have longer exchange rates than those situated on the outside of the molecule. A new twist was the application of H/D exchange for probing the interaction region of protein-protein complexes. Three-dimensional information can therefore be gathered using simple methods, and access to complex structural properties can be obtained by mass spectrometry.

New developments in the mass-spectrometric detection of noncovalent complexes were presented throughout the conference. As these complexes are fragile and often only stable at physiological conditions, soft ionization/desorption techniques must be used for analyzing such complexes. While electrospray-ionization (ESI) mass spectrometry is already well-established for analyzing noncovalent complexes, as was shown by many interesting papers, matrix-assisted laser desorption/ionization (MALDI) mass-spectrometric detection of these compounds is just starting to be explored. Current research in this field focuses on the extent to which these fragile complexes survive the MALDI process and what sample preparation technique is most effective (*K. Strupat*, *F. Hillenkamp* and coworkers; *C. Borchers* and *K. Tomer*; *A. Woods*, *R.J. Cotter*, and coworkers; our group). Protein-DNA and protein-protein complexes up to 100 kDa have been successfully detected with MALDI MS. It still controversial whether the complexes are incorporated into the matrix or simply crystallize on top, and what the importance of matrix and solution pH is for a successful experiment. In terms of the mechanism of MALDI, the ability to transfer fragile complexes from solution to the gas phase also supports the hypothesis that in addition to ions formed in the plume by gas-phase ion-molecule reactions, 'pre-formed ions' contribute to the MALDI ion signal in many cases. The results presented during the ASMS conference seem very promising for future applications of MALDI MS in the detection of high-mass noncovalent aggregates or supramolecular assemblies.

Affinity capture is a method where a chemically modified surface is used to bind selected molecules in solution by specific host-guest interactions. It has now reached a point where researchers trust its usefulness for direct mass-spectrometric analysis of the affinity capture surface. Several posters (*e.g.*, by *R.W. Nelson*) showed the successful combination of affinity capture with MALDI MS. In earlier, less successful attempts, compounds designed to enhance desorption/ionization from the affinity capture surface were co-immobilized on the capture surface. Now, researchers simply apply an acidic MALDI matrix to the capture surface after the binding and washing steps, which dissociates the host-guest complex and forms a sample ready for MALDI-MS analysis. An elegant application of affinity-capture mass spectrometry was presented by *J. Bundy* and *C. Fenselau*. They immobilized lectin, which specifically binds glycosylated peptides or proteins. Since glycoproteins are present on most cell surfaces, they were able to specifically extract the cellular content of complex mixtures, *e.g.*, urine. After a washing step and the application of an acidic MALDI matrix, the mass spectrum showed compounds from cell walls exclusively (interestingly, it was dominated by signals from lipids). An unmodified probe surface gave only noise in the mass spectrum, which underscores the high specificity of the affinity capture process.

A nonscientific highlight of the meeting was the official conference dinner, which took place at Sea World, a somewhat less 'artificial' theme park compared to Disney World. A special show of the trained killer wales (Orcas) was organized for the ASMS participants. The evening continued with a sea-food dinner in the open, a stroll to visit other attractions at Sea World, and was concluded by fireworks lighting the Florida night sky.

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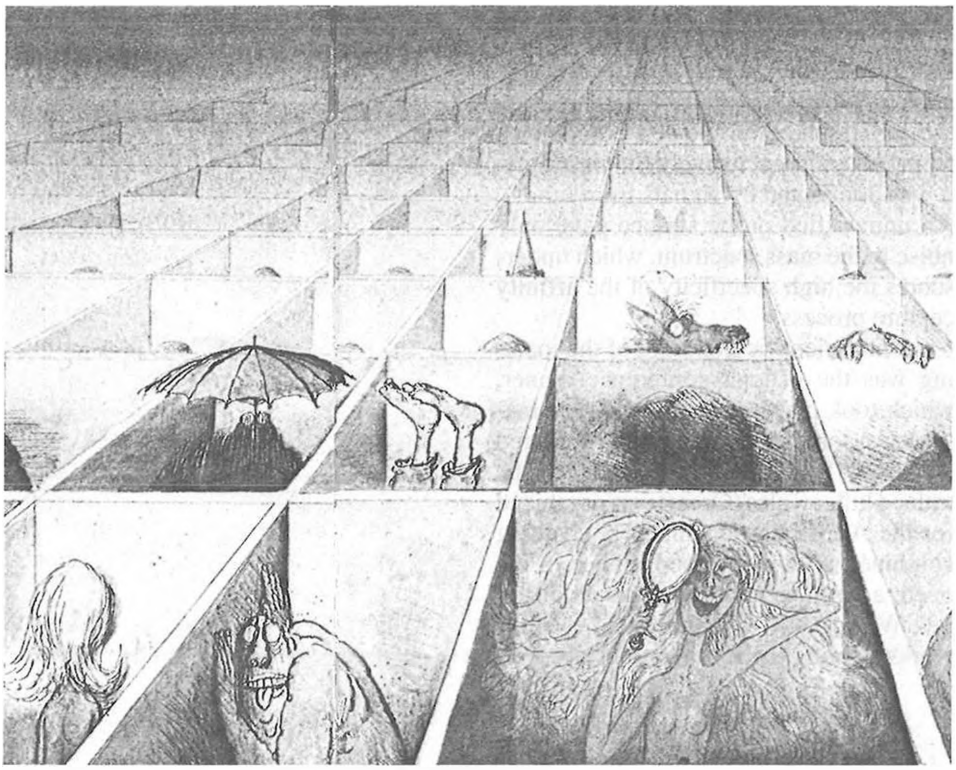
33rd Euchem Stereochemistry Conference Bürgenstock, April 26–May 2, 1998

The 33rd Euchem Stereochemistry Conference, this year under the presidency of Prof. *Manfred T. Reetz* (*Max-Planck*-Institut für Kohlenforschung, Mülheim, Germany), brought together 133 participants from 24 countries, both from academia and industry. The conference is traditionally held at the Bürgenstock hotel complex, a resort situated high above the Vierwaldstätter See with a spectacular view of the lake and the surrounding mountains. Since the very beginning in 1965, it has always been the custom not to announce the program in advance. Therefore, the registration procedure is much more exciting than at other meetings: only during registration, the participants are provided with a printed program. As usual, the subjects covered by the invited speakers reflect the interests of the meeting's president, and so it was no surprise that bioorganic chemistry and transition-metal catalysis were the two cornerstones of the program. In his Sunday night welcome address, Prof. *Reetz* introduced this year's guest of honor, Prof. *Helmut Ringsdorf* (University of Mainz, Germany), who was the president of the 26th Bürgenstock conference in 1991, and the vice president, Prof. *Javier de Mendoza* (University of Madrid, Spain).

The first day of lectures was entirely devoted to biochemical issues. The opening lecture 'Synthetic mimics of the structure and function of DNA' was given by *Eric T. Kool* (University of Rochester, USA). He summarized his research of the past years concerned with synthetic mimics for nucleoside bases, in particular 4-methylbenzimidazole and 2,4-difluorotoluene as models for adenine and thymine, respectively. These compounds, isosteric 'shape mimics' with regard to their naturally occurring counterparts, were used in duplex binding studies aimed at understanding the fidelity of DNA replication. Of course, the nonpolar difluorotoluene is not able to take part in hydrogen bonding, and shows a typical mismatch affinity towards adenine as well as towards the other natural bases. The somewhat provocative conclusion was that, contrary to the prevailing wisdom, hydrogen bonds between bases are not at all required for efficient replications with high fidelity. Instead, a subtle interplay between shape/size and solvation/desolvation effects appears to govern the nucleotide polymerization. A vigorous and lengthy discussion followed this presentation, during which many people in the audience justly addressed the confusion connected with the 'π-stacking' concept in biochemistry.

The second lecture, given by *Jennifer A. Doudna* (Yale University, USA), brought a change from DNA to RNA. Her subject was the crystal structure of the group I ribozyme of *Tetrahymena termophilia*, which gave fascinating insights into the structure and folding of this prominent ribozyme. The crystal structure revealed two highly unusual structural motifs, an 'A-rich bulge', where in a *Pauling*-DNA fashion the nucleotide bases lie outside and the phosphates inside, and an 'adenosine platform'. By metal-ion soaking experiments, it could be established that for both motifs the complexation to metal ions, Mg^{2+} in the case of the A-rich bulge, K^+ for the adenosine platform, is



This picture was used more than once by Prof. Helmut Ringsdorf *to demonstrate to the audience the lack of communication between different disciplines in the sciences.* He emphasized the importance of meetings like the 'Bürgenstock' as crystallization nuclei for truly interdisciplinary thinking.

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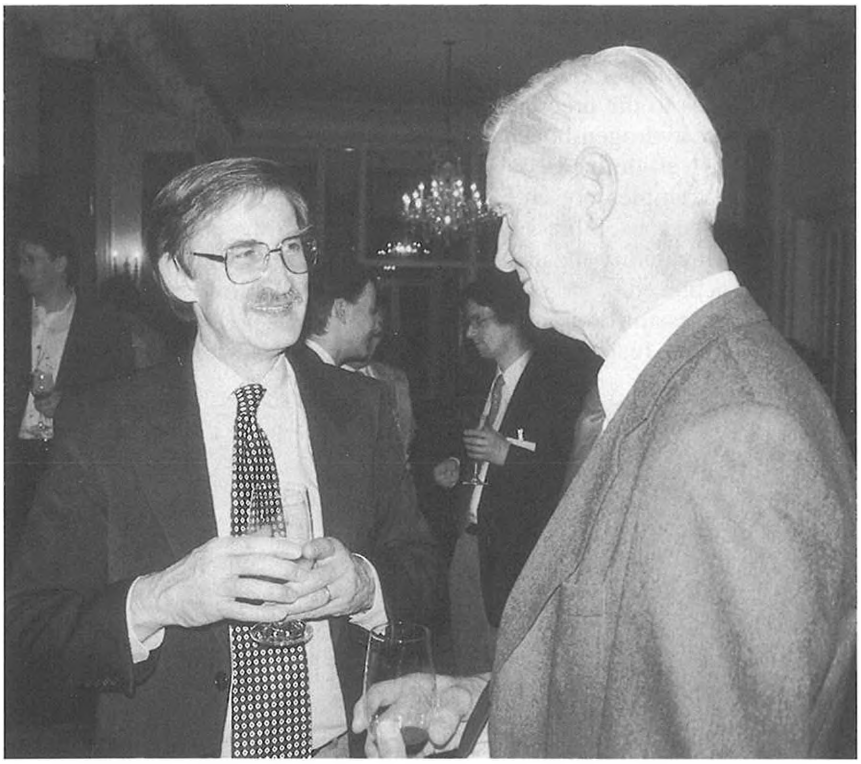


M.T. Reetz *(the President)*

Sir A. Battersby

E.T. Kool

crucial for the formation of the tertiary structure.

On Monday afternoon, the first of two poster sessions was held, followed by a second one on Thursday and Friday afternoon. All together, more than 40 posters spanning a wide range of subjects were presented. The younger participants, most of whom were supported by the European Science Foundation (Strasbourg) and the Swiss National Science Foundation, therefore had the opportunity to present their work to the distinguished community.

The evening session of the opening day was occupied by *Bauke W. Dijkstra* (BIOSON Research Institute, Groningen, NL) with his lecture 'Insights in enzyme mechanisms from X-ray crystallography'. The subject being again X-ray crystallography of biomacromolecules, *Dijkstra* brought a welcome variation by focusing his talk on mechanistic discussions. The first part was devoted to the structures and mechanisms of dehalogenases. In both the haloalkane and haloacid dehalogenases studied, it was possible to elucidate the structures of a series of covalently and non-covalently bound enzyme-substrate complexes, obtained by skillfully varying the crystallization conditions. The second part of the lecture dealt with the structure of cyclodextrin glycosyltransferase (CGTase). *Dijkstra* demonstrated that CGTase operates by distorting its substrates geometrically as well as electronically, and for the first time, it was possible to trap a covalently bound intermediate (for α-amylose) for this class of enzymes. Though ending rather late, this presentation triggered an animated discussion on the origin and evolution of enzymes with anthropogenic substrates.

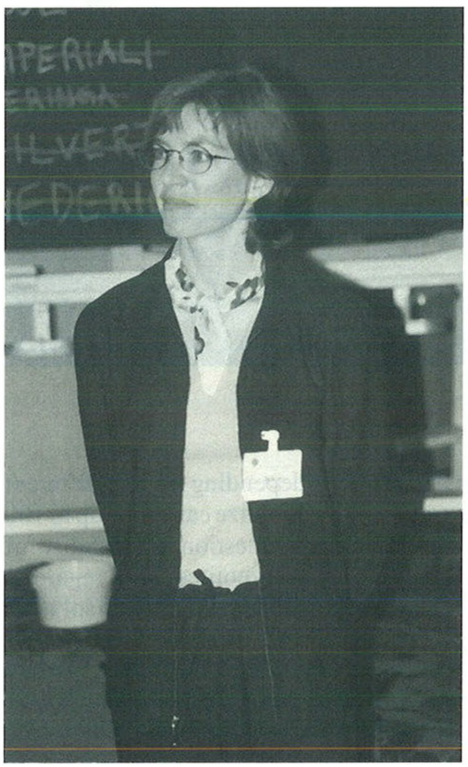
Biochemistry still had a firm grip on the audience during the Tuesday morning session, moderated by *Donald Hilvert*. In the first presentation, *Francine B. Perler* (New England Biolabs, Beverly, USA) gave some insight into her research on the mechanism and biotechnological applications of the so-called inteins, a class of self-splicing proteins. The reaction steps of the splicing mechanism, an N–O shift (to serine) followed by transesterification *via* a branched intermediate, were outlayed in detail. A remarkable feature of the inteins is that they can also act as endonucleases, with the splicing and the endonuclease activities having no relationship. In other words, the splicing domain and the endonuclease domain of the intein are entirely separated.

A very different approach of using proteins was subsequently presented by *Alexey L. Margolin* (*Altus Biologics Inc.*, Cambridge, USA) in his lecture 'Protein crystals as novel microporous materials'. The starting point of his research is based on the need for microporous solids beyond zeolites, *i.e.*, larger pores, better control over shape and size, and the use of chiral cavities. These requirements are met, perhaps surprisingly, by protein crystals, where – depending on the different proteins – the pore size can reach up to 100 Å. The crucial question of stability of these 'bioorganic zeolites' with regard to temperature, storage, and organic solvents can be solved by cross-linking of the proteins after crystallization, which greatly enhances the stability of the proteins outside the mother liquor. An outlook to a potentially vast field of applications including the utilization of the original enzyme activity in a reactor closed the lecture.

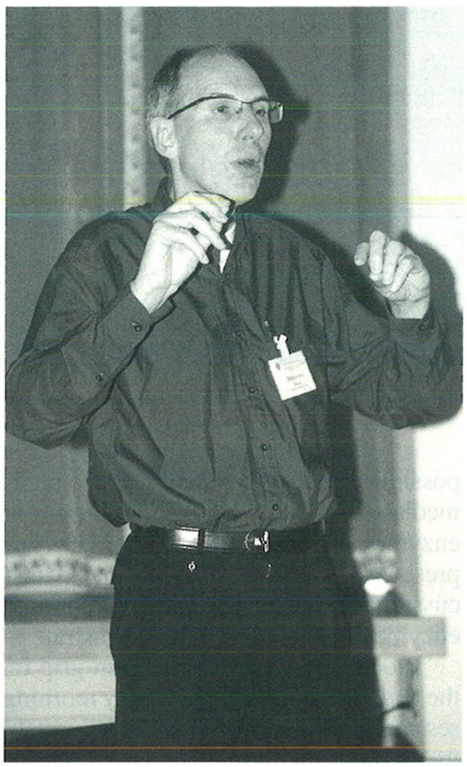
In the afternoon of the second day, a novel format was introduced in that four of the participants were chosen by the president to give short presentations (*ca.* 20 min). *Kiitiro Utimoto* (Kyoto University, Japan) started these short lectures by talking about the preparation and synthetic applications of geminal dizinc compounds in carbonyl olefinations. He was followed by *Ewa Rogalska* (Université Henri Poincaré, Nancy, France) with her presentation 'The last news about bilayers' (which prompted the moderator of this session, *E. Peter Kündig* from the University of Geneva, to comment why she wouldn't rather talk about 'the latest news'). The secret was quickly unveiled, when she reported the surprising variety of helical and fibrous structures formed in mixtures of 2,4,6-trichlorophenol and water. Biochemistry reappeared with a vengeance during the lecture of *Michael Famulok* (University of Munich, Germany), who presented a

selection scheme for a ribozyme with ester-transferase activity, starting from a pool of *ca.* 10^{15} different RNA molecules. The closing talk, without doubt the highlight of this series, introduced a combinatorial approach to the separation of racemates to the amazed audience. The burden of this presentation was shared by two speakers, *Hans Wynberg* and *Ton Vries* (both from *SYNCOM*, Groningen, NL). Appropriately entitled 'A family approach to the resolution of racemates', it introduced the principle of simultaneous addition of more than one resolving agent of a 'family' of resolving agents to a solution of a racemic compound, which leads to the precipitation of the least soluble hydrogen-bonded aggregate, usually of well-defined composition. The many examples presented proved the extraordinary usefulness of this new method both in rapidity and in the enantioselectivities achieved.

Tuesday's evening session brought the great leap forward into the realm of physical organic chemistry. *Wolfram Sander* (Ruhr-Universität Bochum, Germany) told 'The story of *meta*- and *para*-benzyne'. Despite its lability, *ortho*-benzyne has been more or less familiar to organic chemists for a long time, and therefore its isomers have aroused much interest, especially in connection with the chemistry of enediynes. The benzynes were generated in the gas phase by either flash pyrolysis or photolysis of suitable precursors, such as acyl iodides, cyclophanes, and acyl peroxides.



J.A. Doudna

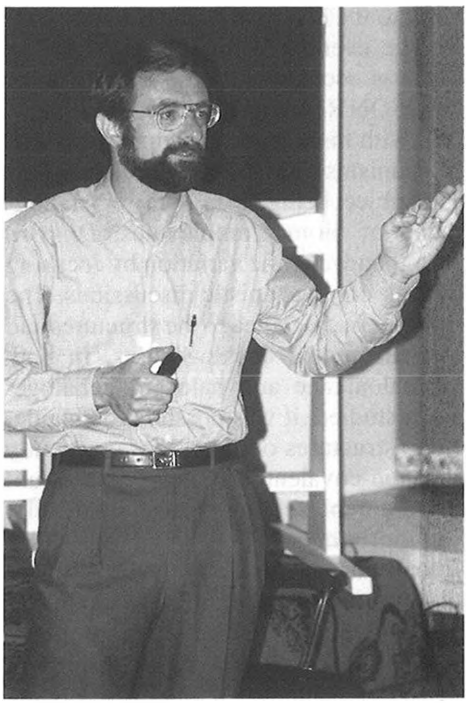


B.W. Dijkstra

B. Imperiali

D. Milstein

E.P. Kündig



A. Togni

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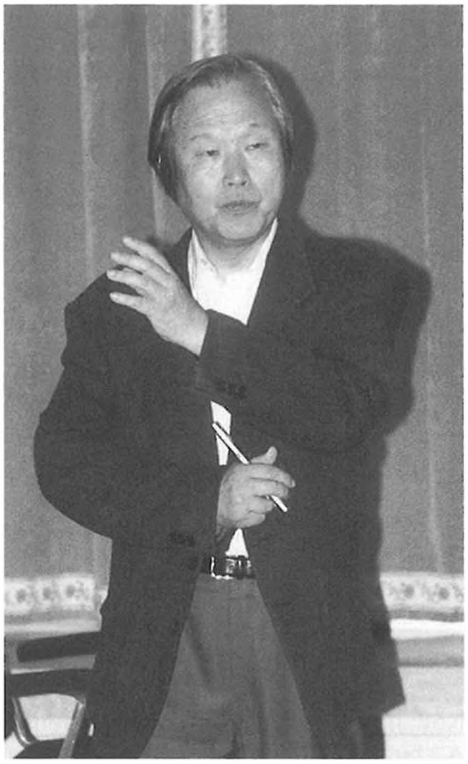
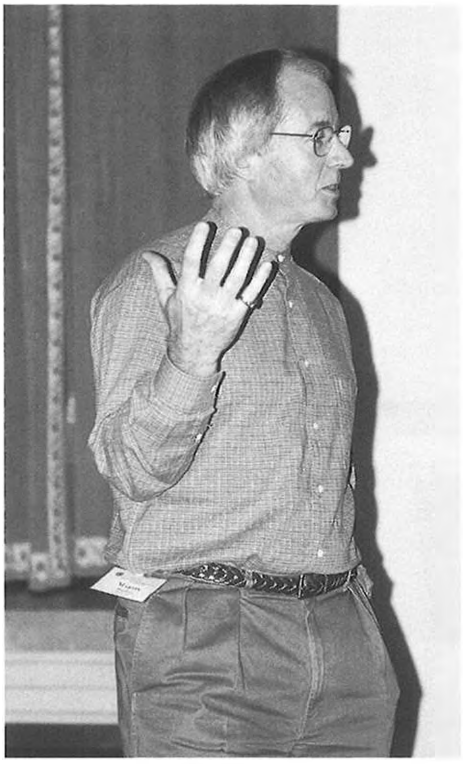
M. Quack



S. Murai



S.F. Martin

Subsequently, the intermediates were trapped in a matrix and characterized spectroscopically by IR techniques. The identification of *meta*- and *para*-benzyne was possible by assigning the experimentally found IR bands to those obtained by high-level *ab initio* calculations.

Bioorganic chemistry was back on Wednesday's morning session with *Barbara Imperiali* (California Institute of Technology, Pasadena, USA) being the first speaker. She reviewed her research on N-linked glycosylation catalyzed by the enzyme oligosaccharyl transferase, an important modification associated with changes in cellular targeting, structure, and function of the protein. Using a wide range of techniques from organic synthesis to molecular biology, she was able to identify minimum requirements for the asparagine-linked glycosylation, *e.g.*, the necessity of the asparagine being one residue away in the sequence from a hydroxyamino acid (Ser or Thr), and the presence of a local Asx-turn. The role of this Asx-turn in the N-linked glycosylation was shown to be a conformational feature modulating the asparagine nucleophilicity. Going one step further, *Imperiali* also presented more recent work on the consequences of glycosylation on the protein conformation studied by fluorescence energy transfer.

A long discussion was followed by Wednesday's second and last speaker, *Herbert Waldmann* from the University of Karlsruhe, Germany. His lecture 'Organic synthesis and biological signal transduction' started with his definition of bioorganic chemistry as an interplay between organic synthesis and biological techniques in order to solve biologically relevant questions. This interplay was demonstrated with the ras pathway of biological signal transduction. The question of the biological mechanism of the *N*-ras protein was addressed by the synthesis of palmitoylated and farnesylated peptide conjugates. By means of fluorescence marking the detailed mechanism of membrane anchoring could be studied *in vivo*.

No lectures were scheduled for Wednesday afternoon, thus offering a welcome opportunity for recreation and relaxation during an otherwise densely packed program. In the evening, the day was elegantly concluded by a chamber-music concert featuring the wife and husband duo *Sieglinde* and *Götz Bucher* (baroque violin and cello) together with *J. Jens Wolff* (harpsichord), the latter two also being active as scientific participants. They presented a colorful mix of French, Italian, and German baroque sonatas.

Thursday morning was a treat for people with an interest in transition-metal catalysis. The first lecture 'The design of new metal-complex catalysis', given by *David Milstein* (The *Weizmann* Institute of Science, Israel), spanned an extremely wide range of selective bond-activation reactions. In the first part, emphasis was put on the C–halogen bond activation by various Pd, Rh, and Ir complexes. The usefulness of this approach for synthetic applications is markedly enhanced by catalytic versions of these metal-mediated reactions, all successfully worked out by *Milstein*'s group. On the other hand, the selective activation of C–O, C–H, and C–C bonds can be achieved by late transition metals using a cleverly devised intramolecular reaction in which the bond to be activated and a bisphosphine moiety are covalently linked.

The baton was then handed to *Antonio Togni* from ETH-Zürich, Switzerland, for the second presentation entitled 'Still ferrocenyl ligands, but not only...'. As expected from the title, the first part of his lecture dealt with the design and synthesis of chiral ferrocenyl ligands, but there was no need for an apology in view of the wealth of results. The design of those ligands is based on two elements of chirality, a plane of chirality and a stereogenic center attached to the side chain of one of the Cp ligands. Enantioselective hydrogenations can be performed with very high selectivities using the corresponding Rh- or Ir-bisphosphine complexes as catalysts, and two important industrial applications of this reaction were proudly presented. To facilitate the recovery of the catalyst, dendrimers with peripheral catalyst units were synthesized, and it was shown that there is hardly any loss in enantioselectivity with these high-molecular weight catalysts. In the last part, the catalytic asymmetric hydroamination of alkenes was an elegant demonstration for

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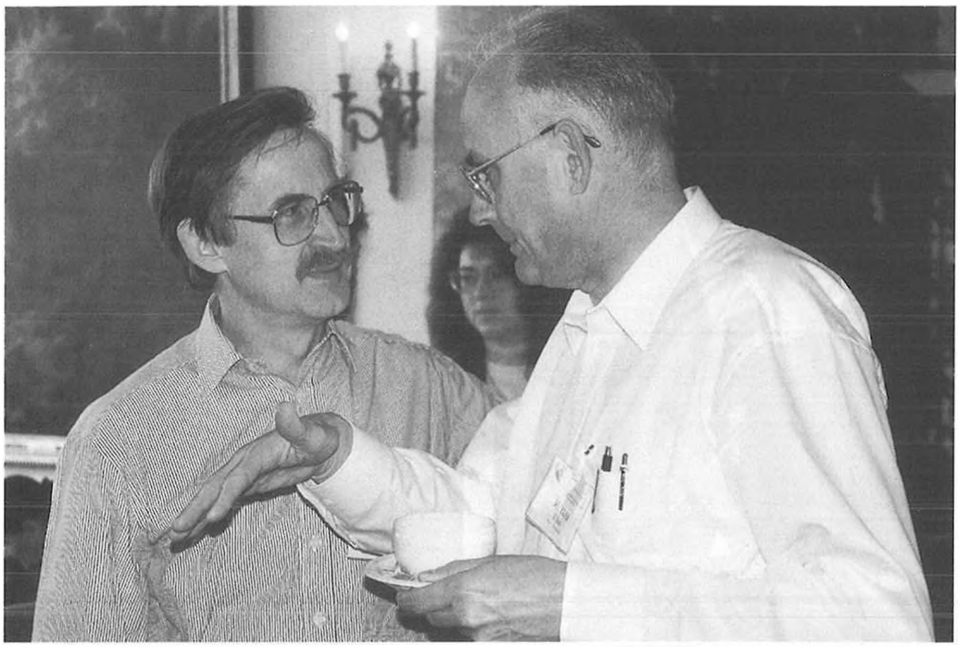

M.T. Reetz *(the President)* K. Müller

the design concepts derived from quantum chemical calculations on model systems successfully transplanted to an Ir-bisphosphine complex which is an active catalyst in solution.

Since chiral molecules naturally play an important role in a conference on stereochemistry, it was high time to learn something about the fundamental principles governing chirality. In the evening session, *Martin Quack*, also from ETH-Zürich, Switzerland, talked with his customary brilliance about 'Fundamental symmetries and the physical-chemical foundations of molecular chirality'. He presented the fundamentally different theoretical views of the physical origin of molecular chirality. Whether the naturally occurring chiral molecules like amino acids and sugars are the result of a *de facto* or *de lege* symmetry breaking can be analyzed upon considering the symmetry-violating weak nuclear interaction. The possibility of a *de lege* symmetry breaking depends on the size of the parity-violating energy difference due to the weak nuclear force, and electroweak quantum chemistry calculations, though not conclusive, have shown it to be on the order of 10^{-15} J. Finally, possible experiments to test the different hypotheses were suggested; an experiment which is based on the generation of states of well-defined parity and the observation of the time dependence of parity is already underway in *Quack*'s laboratory.

Finally, the last day brought us back to what is generally regarded as traditional synthetic chemistry. The start was made by *Dieter Hoppe* (University of Münster, Germany) with 'Chiral carbanion pairs: New insight and synthetic applications'. A chiral carbanion pair is defined as an enantiomerically enriched ion pair consisting of a carbanion and a cation (mostly Li^+) being stereogenic at the carbanion moiety. Of crucial importance for synthetic applications is the configurational stability of the sp^3-type pyramidal carbanion. By using the so-called carbamate trick, *i.e.*, deprotonation α to the alcohol oxygen of a carbamate, the anion is stabilized by intramolecular complexation of the metal to the carbonyl oxygen atom. For most enantioselective reactions, (–)-sparteine has proven to be the best chiral complexing agent. In the course of his lecture, *Hoppe* presented not only a plethora of applications in enantioselective synthesis, but also many insights into mechanistic features of the reaction.

The next speaker was *Shinji Murai* from Osaka University, Japan, talking about 'The catalytic C–H/olefin coupling as a new synthetic tool'. The reaction in question is the formal insertion of an olefinic C–C bond into a C–H bond, usually of an aromatic compound. This can be accomplished by using $RuH_2(CO)(PPh_3)_2$ as a catalyst. The directing effects of carbonyl groups in the C–H component were discussed in detail. The scope of the reaction was extended to heteroaromatics and cycloalkenes. In the last part, extensions of the concept to compounds beyond simple olefins were outlayed. The reaction with carbon monoxide, which would give aromatic aldehydes, is endothermic, but in combination with an olefinic compound leads to the formation of the formal product of a *Friedel-Crafts* acylation. Successful applications of this methodology with nitrogen-containing heterocycles were presented.

Before the last lecture of this year's Bürgenstock conference was held, *Klaus Müller* (*F. Hoffmann-La Roche AG*, Switzerland), one of the members of the organizing committee, announced details of next year's conference, which will take place from April 24–30, 1999. The next year's vice president was chosen to be *Jean-François Normant*, by default the president of the conference in the year 2000. After this outlook, the last speaker, *Stephen F. Martin* (The University of Texas, Austin, USA) was introduced by *Javier de Mendoza*. Following a long-standing tradition at the Bürgenstock, the last presentation was devoted to natural product synthesis. *Martin* reported total syntheses of popular target molecules, trying to improve on established routes in terms of efficiency as well as elegance. Manzamine A, *e.g.*, was synthesized using an intramolecular *Diels-Alder* reaction of (*Z*)-trisubstituted dienes as a key step. Strychnine and akuammincine, both indole alkaloids of the strychnos family and classic targets for natural product synthesis, were made using a biomimetic strategy that requires the fewest reaction steps so far. Finally, the total syntheses of croomine and zaragozic acid A were successfully completed *via* novel approaches, in the first case a vinylogous *Mannich*, in the second a vinylogous aldol reaction. Having been carried away by his enthusiasm and extended the time limit by 20 min, the speaker did not have to answer too many questions in the discussion section from a seemingly exhausted audience.

The last number, also a long-cherished tradition, was a summary of the week's proceedings by *Klaus Müller*. In his peculiar, inimitable style he managed to reveal all sorts of hidden correspondences between the talks and the speakers (and sometimes even the moderators), leaving nobody in the audience unaffected. On Saturday morning, May 2, 1998, finally, the participants left the hospitable Swiss resort, and despite the drizzling rain, most of them said goodbye with a slight feeling of regret. The magic of the location and the unique atmosphere of interdisciplinarity had left a deep impact on the participants, and one need not be a prophet to predict that many of them will come back for one of the future incarnations of the Bürgenstock meeting.

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Section for Medicinal Chemistry (SMC)
of the New Swiss Chemical Society (NSCS)

Bioavailability in Drug Discovery and Development

The Section for Medicinal Chemistry organized a minisymposium on the hot topic mentioned above on May 7, 1998, at the University of Basel with support by the Basel Chemical Society and the Basel Pharmaceutical Industries. Five speakers were invited: *Christopher A. Lipinski* (*Pfizer*, Groton, CT), *Dhiren R. Thakker* (Univ. of NC, Chapel Hill), *O. Helen Chan* (*Parke Davis*, Ann Arbor, MI), *T. Weller* (*Roche*, Basel), and *R. Albert* (*Novartis*, Basel).

Christopher A. Lipinski: 'The Rule of Five for Oral Drug Absorption'

Despite substantial progress in lead finding *via* high-throughput screening and *in vitro* lead optimization *via* combinatorial chemistry, the rate-limiting step of drug discovery is in many cases the optimization of the *in vivo* activity. *Lipinski* set up a simple rule based on a thorough analysis of the absorption of > 3000 INN drugs. In general, poor absorption is to be expected, when a compound contains > 5 H-donors, has a molecular weight of > 500, has a *c*log*P* >5, about equal to a (*Moriguchi*) *M*log*P* > 4.15, and contains a sum of H-acceptors (mostly N + O) > 10. For CNS-active drugs, the rules must be adapted to max. 3 H-donors and max. 7 H-acceptors. *Pfizer*'s medicinal chemists submit their compounds prior to registration to the physicochemical labs to determine the above-mentioned parameters, in particular using high-throughput turbidometric solubility measurements in flow cells operating with only 1 mg of compound (capacity: 45 cpds/day = 10000/year).

Lit.: C.A. Lipinski, F. Lombardo, B.W. Dominy, P.J. Feeney, 'Experimental and computational approaches to estimate solubility and permeability in drug discovery and development settings', *Adv. Drug Delivery Rev.* **1997**, *23*, 3.

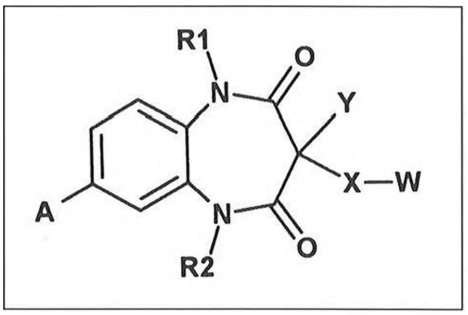
Dhiren R. Thakker: 'Orally Absorbed Drugs: Rational Design through Structure-Transport Relationships'

The therapeutic efficacy of a drug depends on three parameters: potency, systemic availability, and duration of action. Our understanding of structure-bioavailability relationships for orally absorbed drugs is still very limited. Appropriate *in vitro* models, *e.g.*, Caco-2 cells, are useful to elucidate the roles of various physical and biochemical barriers (metabolic enzymes, drug transporters, and the multidrug resistance (MDR)-P-glycoprotein) to drug absorption.

- *Example 1*: *'Differentiation between transcellular and paracellular transport through the intestinal epithelium'.*
  [^{14}C]Ondansetron is transported across the intestinal epithelium *via* a transcellular transport. The rate of transport in presence of (1.25 mmol) and absence of Ca^{2+} ions is about the same. [^{3}H]-Ranititine is transported *via* a paracellular pathway. In a Ca^{2+}-free medium, the tight junctions open up allowing a 15 times higher transport rate (expressed as apparent permeability coefficient, P_{app} in 10^{-7} cm/s) than in presence of a high extracellular Ca^{2+} concentration.
- *Example 2*: *'Differentiation between apical to basolateral and basolateral to apical transport'.*
  These measurements are carried out in TRANSWELL™ cells. If the P_{app} values for AP→BL transport, are considerably lower than for the BL→AP transport the (MDR)-P-glycoprotein transmembrane pump may be involved, as is the case with cyclosporin A. The transport in the apical to basolateral direction is attenuated by the P-glycoprotein by a factor of 10 at a concentration of 0.5 μM, but diminishes at higher concentrations suggesting that the apically directed efflux is a saturable process.
- *Exampel 3*: *'Orally available CCK-A agonists for the treatment of obesity'.*
  The empirical values for the correlation between permeability across Caco-2 cells and drug absorption are:

P_{app} 10^{-7} cm/s	1	3	32	128
% Absorption	8	39	74	93

Screening a series of 77 CCK-A receptor agonists from the class of benzo-1,5-diazepine-2,4-diones of the general formula *vide infra* more than 50% had P_{app} values < 2, *ca.* 25% P_{app} values of 2–10, and only 25% > 10. Replacement of the anellated and substituted (R1, R2) phenyl rings in the benzo-1,5-diazepines with pyridyl rings resulted in compounds with significantly enhanced P_{app} values (P_{app} (pyridyl)/P_{app} (phenyl) = 7.25) providing an improved series with a significantly higher hit rate for well-transported compounds.



Lit.: L.-S.L. Gan, D.R. Thakker, 'Applications of the Caco-2 model in the design and development of orally active drugs: elucidation of biochemical and physical barriers posed by the intestinal epithelium', *Adv. Drug Delivery Rev.* **1997**, *23*, 77.

O. Helen Chan: 'Factors, which Affect Rate and Extent of GI Absorption'

- *Example 1*: *'Renin inhibitors'.*
  Eight RIs were selected comprising a wide range of physical properties (as molecular weight: 243–809, log*P*: 1.5–4.7, and H-bonding *N* values: 6 to 17.5). Stability towards enzymatic degradation in the GI tract was checked using rat intestinal perfusate, pancreatic trypsin-chymotrypsin preparations and rat jejunum brush border membranes showing that three compounds had insufficient stability for their respective GI transit times. The intestinal permeabilities of the RIs were ex-

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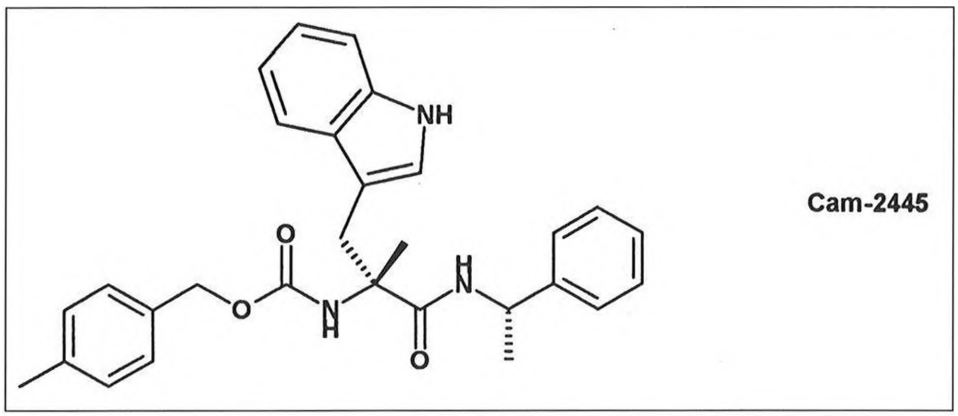
amined in three different models: rat intestinal perfusate, *in vitro* rat intestinal ring uptake, and Caco-2 cell monolayers. The rank order of permeabilities of the compounds in the three models were comparable. The absolute permeabilities in cm/s · 10^{-4} were ring uptake > perfusion > Caco-2. Permeabilites of the eight RIs in the rat intestinal perfusate experiments were correlated with log*P*, *MW*, and H-bond number *N*. The least hydrophilic neutral compounds exhibited high permeability, which decreased with increasing molecular weight and H-bonding potential. The BDC rat model was used as *in vivo* model administering ^{3}H- or ^{14}C-labelled compounds orally and intravenously to surgically prepared animals measuring the total radioactivity at selected time points in perfusate, urine, and bile.

Lit.: O.H. Chan, B.H. Stewart, 'Physicochemical and drug-delivery considerations for oral drug bioavailability', *Drug Discovery Today* **1996**, *1*, 461.

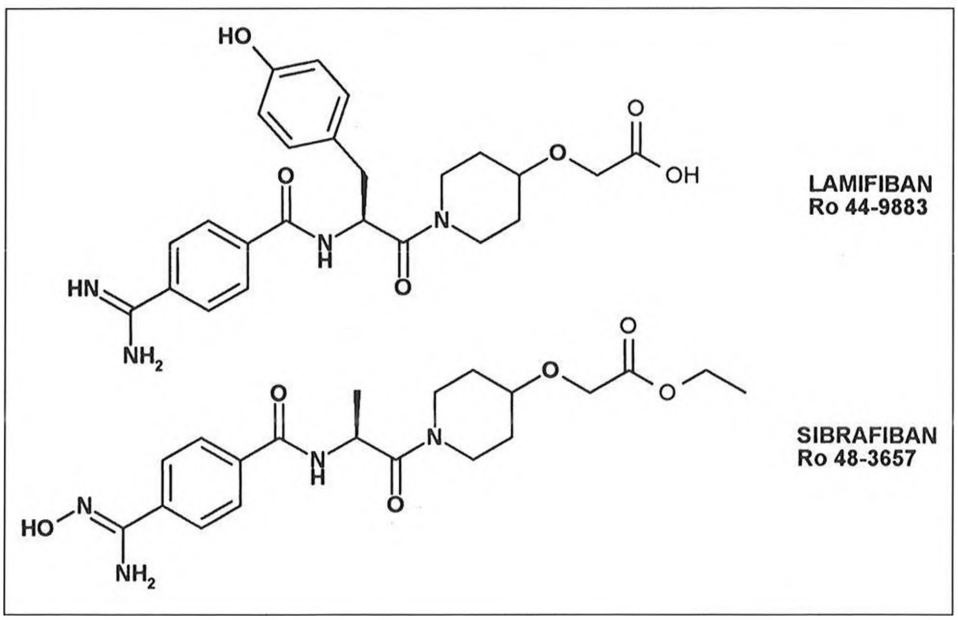
– *Example 2*: *'NK1 receptor (substance P) antagonists'*.

Cam-2445 (PD148300) (*MW* = 470, log*P* = 3.8, solubility < 2 μg/ml) has an oral bioavailability of only 1.4% in rats. It is stable in incubations with 0.1N HCl, pancreatic trypsin-chymotrypsin preparations, rat intestinal perfusate, and rat jejunum BBM suspensions at 37°. Membrane transport experiments across Caco-2 cells seeded on Snapwell polycarbonate membranes and in a rat intestinal perfusion model showed high permeabilities of 158 and 175 · 10^{-6} cm/s, respectively. The good permeabilities cannot account for the bad oral bioavailability. *In vivo* experiments in male Wistar rats using i.v., p.o., intraduodenal, and intraportal administrations were carried out and revealed bioavailabilities of 48% for intraportal, 26% for intraduodenal, and 1.4% for p.o. administration. Due to its low aqueous solubility the p.o. dose of Cam-2445 precipitated in the GI tract and did not redissolve appreciably. The problem was overcome with a water-soluble phosphate prodrug on another derivative, Cam-4451 (PD155561) carrying a primary alcohol function improving its bioavailability to 24%.

Lit.: O.H. Chan, M.W. Sinz, B.H. Stewart, 'Multiple-model evaluation of absorption of a tachykinin receptor antagonist', *Adv. Drug Delivery Rev.* **1997**, *23*, 121.



Cam-2445



LAMIFIBAN
Ro 44-9883

SIBRAFIBAN
Ro 48-3657

***Thomas Weller*: 'Fibrinogen Receptor Antagonists: From Injectable Drugs to Orally Active Compounds'**

Starting from the tripeptide Arg-Gly-Asp-OH (IC_{50} = 88 μM), the recognition site for the family of integrin receptors, extensive optimization work led to Lamifiban, Ro 44-9883 (IC_{50} = 33 nM), currently in Phase 3 clinical evaluation for the treatment of acute myocardial infarctions (i.v. administration).

Lit.: L. Alig, A. Edenhofer, P. Hadváry, M. Hürzeler, D. Knopp, M. Müller, B. Steiner, A. Trzeciak, T. Weller, 'Low molecular weight, non-peptide fibrinogen receptor antagonists', *J. Med. Chem.* **1992**, *35*, 4393.

The BAV for oral administration in rats was < 3%. Three approaches were worked on in order to improve on the oral BAV, development of new scaffolds, replacement of the polar amidine and carboxylate groups, and prodrugs. Finally, the double prodrug, the amidoxim-ethylester, Sibrafiban, Ro 48-3657, showed BAVs in mice of 56%, in rats of 26%, in dogs of 25%, and in *Rhesus* monkeys of 33%. Phase 3 clinical studies for the treatment of acute coronary syndrom were initiated.

Lit.: T. Weller, L. Alig, M. Beresini, B. Blackburn, S. Bunting, P. Hadváry, M. Hürzeler Müller, D. Knopp, B. Levet-Trafit, M.T. Lipari, N.B. Modi, M. Müller, C.J. Refino, M. Schmitt, P. Schönholzer, S. Weiss, B. Steiner, 'Orally active fibrinogen receptor antagonists. 2. Amidoximes as prodrugs of amidines', *J. Med. Chem.* **1996**, *39*, 3139.

***Rainer Albert*: 'SDZ CO 611: a Highly Potent Glycated Analog of Somatostatin with Improved Oral Activity'**

Octreotide, a metabolically stable ($t_{1/2}$ = > 20 h) analog of the natural neuropeptide somatostatin ($t_{1/2}$ = 2–3 min) is widely used for the treatment of tumors in the gastro-entero-pancreatic system. It is ap-

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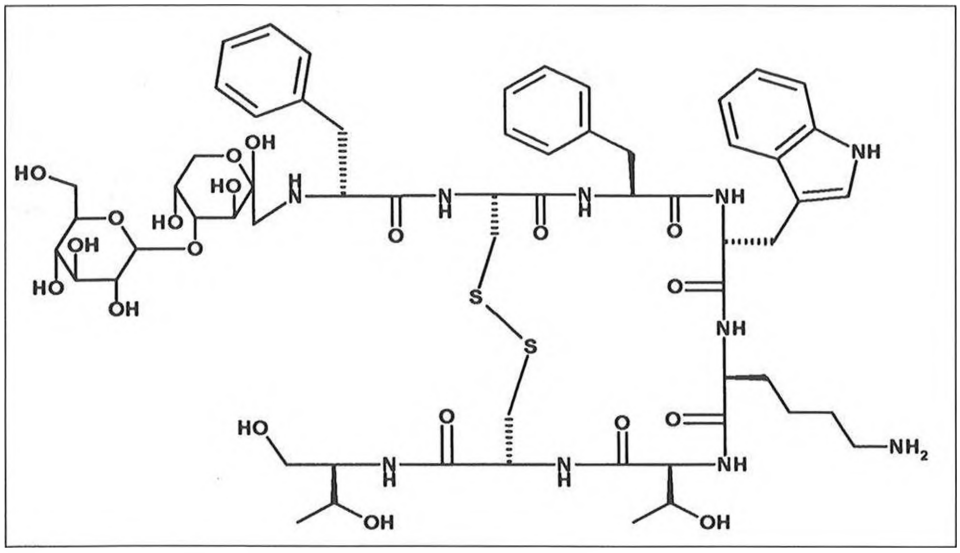

plied *via* subcutaneous injections. Using the *Maillard* reaction with (+)-D-maltose, the compound Ilatreotide, SDZ CO 611, was prepared in good yield showing >10 times higher plasma levels after oral administration in *Rhesus* monkeys.

Lit.: R. Albert, P. Marbach, W. Bauer, U. Briner, G. Fricker, C. Burns, J. Pless, 'SDZ CO 611: a highly potent glycated analog of somatostatin with improved oral activity', *Life Sci.* **1993**, *53*, 517.

Dr. *Wolfgang Froestl*
Novartis

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ISSN 0009–4293

14. PSI-Tagessymposium Elektrochemische Energiespeicherung

Am 1. Juli 1998 trafen sich am PSI Fachleute aus der Industrie und von Universitäten zum 14. PSI-Tagessymposium Elektrochemische Energiespeicherung. Das Symposium hat wieder bestätigt, dass es in der Schweiz eine relativ grosse Interessensgruppe für Brennstoffzellen, neuartige Batterien und Superkondensatoren gibt. Membranen und Separatoren spielen bei diesen Stromquellen eine wichtige Rolle. Das 14. Tagessymposium war deshalb ganz dem Thema 'Membranen und Separatoren' gewidmet. Dabei wurden neuste Aspekte der Grundlagenforschung, das Angebot kommerzieller Produkte und rein praktische Aspekte industrieller Anwendungen vorgestellt und diskutiert.

Dr. *K.-D. Kreuer* vom Max-Planck-Institut für Festkörperforschung, Stuttgart, stellte neuste Erkenntnisse zum Transportmechanismus protonenleitender Polymermembranen vor. Er zeigte, dass in Gegenwart von Wasser Polymermembranen mit fixierten Sulfonsäuregruppen zu einer hydrophil/hydrophoben Entmischung im Nanometer-Bereich neigen, wobei Wasserkanäle im Nanometer-Bereich gebildet werden. Der Abstand der fixierten Sulfonsäuregruppen beträgt in diesen Kanälen typischerweise etwa 0,7 nm. Die Wassermoleküle in diesen Kanälen dienen als Vehikel für den Transport der Protonen, wobei die Beweglichkeit der Wassermoleküle resp. Protonen umso grösser ist, je hydrophober die Wände der Wasserkanäle sind. Die Hydrophobie des Polymergerüstes der Membran ist deshalb für den Transport sehr wichtig.

Anschliessend zeigte Dr. *H.-P. Brack*, PSI, wie aus billigen Folien durch die Strahlenpfropfmethode qualitativ hochstehende, protonenleitende Membranen für Brennstoffzellen hergestellt werden können und wie durch eine gezielte Quervernetzung der Membran die Ionenleitfähigkeit und die Lebensdauer beeinflusst werden können.

Nach der Kaffeepause zeigte Dr. *F. Büchi*, PSI, wie Membranen durch eine Strompulsmethode während des Betriebes in Brennstoffzellen charakterisiert werden können. Mit einigen Tricks gelingt es, mit dieser Methode auch wertvolle Aussagen über das Wasserkonzentrationsprofil in der Membran zu machen.

Am Nachmittag berichtete Dr. *K.-J. Behling, Du Pont de Nemours*, über die Vorzüge der Nafion-Membran in Brennstoffzellen, und dass die Performance dieser Membran auch vom Elektroden/Membranen-Interface beeinflusst wird. Dr. *Behling* ist überzeugt, dass bei einem genügend grossen Marktvolumen der Preis dieser Membranen drastisch reduziert werden kann, was für den Einsatz in kommerziellen Brennstoffzellen eine wichtige Voraussetzung ist. In der anschliessenden Diskussion wurde das Problem der nötigen Preisreduktion noch ausführlich diskutiert.

Dr. *I. Exnar*, *Renata AG*, kam dann auf die Anwendung von Membranen in Zink-Silberoxid-Batterien zu sprechen. Auch hier ist der Preis der Membran sehr wichtig. Es muss der Transport der freien Silberionen zur Zinkelektrode verhindert und ein freier Transport von OH^--Ionen gewährleistet werden. Strahlengepfropfte, ionenleitende Membranen sind auch bei dieser Anwendung interessant.

Abschliessend berichtete Dr. *R. Kötz*, PSI, über die Anforderungen an Separatoren für Superkondensatoren (elektrochemische Doppelschicht-Kondensatoren). Bei dieser Anwendung strebt man eine besonders hohe Leistungsdichte an. Der Separator sollte den Innenwiderstand der Zelle nur unwesentlich vergrössern. Interessant sind für diese Anwendung elektrolytgetränkte, hochporöse Separatoren mit einer Dicke von etwa 10 µm und guten mechanischen Eigenschaften.

Eine Dokumentation mit den Zusammenfassungen der Vorträge und Kopien der wichtigsten Folien, die während der Vorträge gezeigt wurden, kann bei *Ursula Grütter*, PSI, angefordert werden.
Tel. +41 56 310 29 19,
E-Mail: ursula.gruetter@psi.ch

O. Haas

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L'EIG contribue au développement de procédés d'épuration de l'air par perméation

Anne Dimitrov-Wagenknecht* et **Edmond Goy***

Introduction

Une gestion optimale de notre environnement devient une nécessité que personne ne peut remettre en cause. Les Etats, les entreprises privées et publiques en sont conscients et investissent d'importantes sommes pour établir des directives, développer des procédés et réaliser des équipements limitant les effets polluants des activités humaines.

Depuis plusieurs années, la filière de génie chimique de l'école d'ingénieurs de Genève est particulièrement active dans le domaine de la gestion de l'environnement. Principalement dans la formation des ingénieurs avec une orientation en 'environnement' qui sera proposée aux étudiants dès la rentrée 1998 dans le cadre de la formation HES, mais aussi par des projets de R&D, en particulier sur le développement de procédés destinés aux traitements de l'eau, de l'air et du sol, à la valorisation ou recirculation de sous-produits ou de déchets.

Le centre de compétences REALTECH (Ressources alimentaires & Technologies environnementales et chimiques) a été accepté par le comité stratégique de la HES-SO. Ses objectifs sont la mise en commun de compétences complémentaires et la constitution de groupes de travail interdisciplinaires permettant une bonne gestion des interfaces entre les divers secteurs technologiques.

Le domaine de compétence 'Environnement et développement de procédés' fait partie de ce centre de compétences et sera progressivement développé à l'EIG en fonction de projets de R&D. Dans le but de contribuer à la mise au point de technologies et de procédés respectueux de l'environnement, les travaux s'orienteront dans trois domaines pour lesquels des moyens importants ont déjà été engagés à Genève. Il s'agit principalement de:

- Traitement des eaux, élimination des métaux lourds par procédés physiques, chimiques ou électrochimiques.
- Purification de liquides, de l'air ou de gaz par divers procédés membranaires

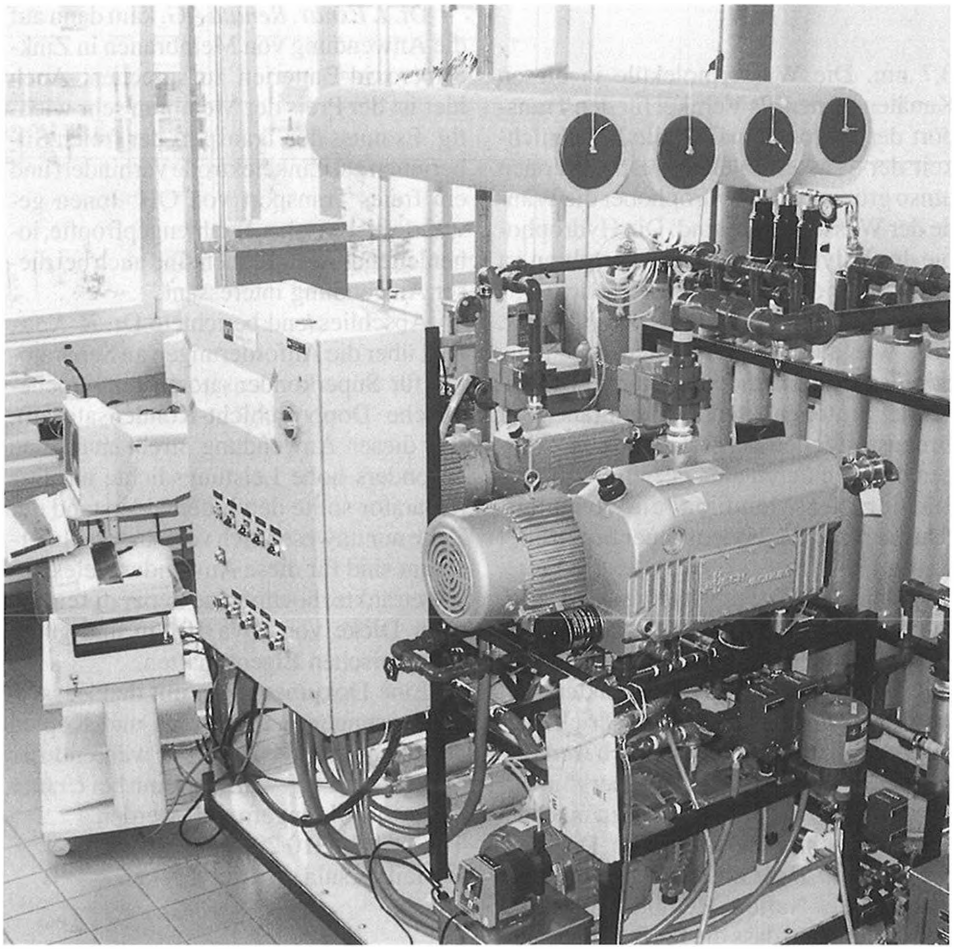

Fig. 1. *Installation pilote du laboratoire*

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(perméation, pervaporation, distillation transmembranaire, osmose inverse, valorisation du biogaz, *etc.*).
- Epuration des sols (lixiviation, phytoépuration).

Dans le domaine du traitement de l'eau et de l'air, l'EIG développe ses compétences sur les procédés électrochimiques et membranaires afin de définir et comparer de façon précise les possibilités d'application industrielle (performances, durée de vie, coût). Elle engagera prochainement des actions de formation dans les PME, pour promouvoir la connaissance et l'application des normes ISO 9000 et ISO 14000 dans l'industrie chimique.

En ce qui concerne le traitement des déchets nucléaires, l'EIG développe une spécificité unique en Suisse dans ce domaine lié à la gestion de l'environnement. Des projets de R&D sont en cours sur l'optimisation de la qualité des déchets nucléaires conditionnés, à la réduction des volumes de ces déchets et à la minimalisation des quantités de nucléides de longue durée de vie dans certains déchets.

Les mesures de la radioactivité dans les sols et dans les aliments sont indispensables dans l'optique d'une gestion sérieuse de l'environnement.

En plus des projets en collaboration avec des partenaires externes, des travaux en collaboration avec d'autres départements de l'EIG (génie civil) ou d'autres écoles de la HES-SO (EI Lullier), sont aussi envisagés. Par exemples: Environnement et milieux bâtis, phytoépuration des sols, cimentation des déchets nucléaires.

Exemple d'un projet de purification d'air par perméation transmembranaire

Les émissions de composés organiques volatils (COV) et/ou odorants doivent être réduites pour protéger l'environnement et pour satisfaire aux prescriptions légales de l'ordonnance sur la protection de l'air (Opair). La perméation transmembranaire offre une solution intéressante par rapport aux procédés classiques tels l'adsorption, la condensation, les biofiltres, l'incinération ou le lavage; ses avantages sont inhérents aux techniques membranaires: ce sont principalement le bon rendement énergétique, l'absence de pollution secondaire, la souplesse des installations, l'automatisation simple et la sécurité.

Dans le cadre de différents travaux (R&D, diplôme), nous avons étudié les performances de ce procédé sur de l'air chargé de dichlorométhane avec l'objectif de produire un effluent respectant les normes Opair, soit contenant une concentration résiduaire de COV inférieure à 20 mg/m^3 (*ca.* 5 ppm) et pour des débits inférieurs à 0,1 kg/h.

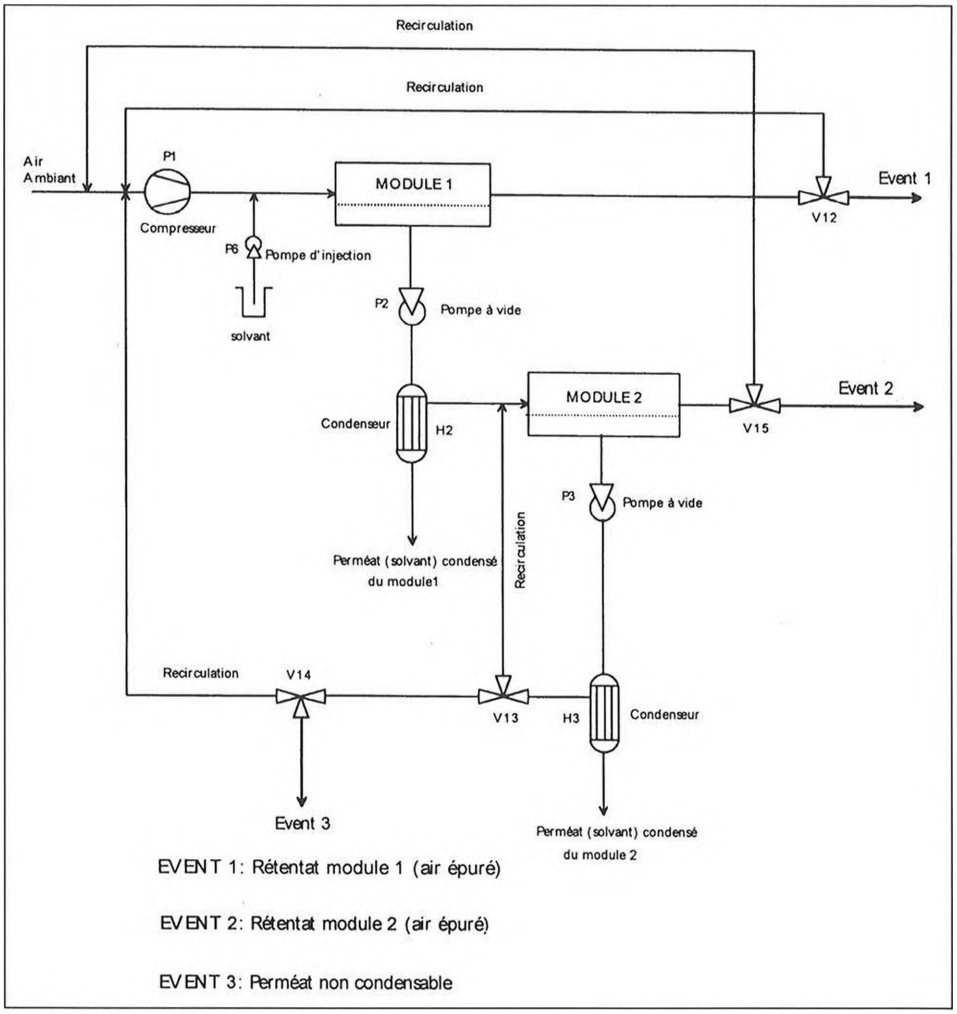

Fig. 2. *Schéma de base du pilote* VaporSep

Cette étude a été conduite à l'échelle pilote, sur une installation *VaporSep* de MTR.

Description de l'appareillage

Le procédé *VaporSep* du Centre de Recherche et Développement américain MTR (Membrane Technology Research) est équipé d'une membrane organophile composée d'un support en polysulfone activé par une couche de silicone. Le perméat s'enrichit en solvant, ce qui permet une condensation relativement facile du produit organique au-dessus de 0°, et l'air épuré se trouve dans le rétentat.

L'installation pilote est composée principalement d'un système de préparation du mélange gazeux à purifier (*e.g.* injection de solvant dans de l'air), de deux compresseurs, de deux pompes à vide, de deux condenseurs et de deux étages de perméation, avec une surface totale de 18 m^2 de membrane. Elle est équipée d'un automate assurant la commande séquentielle du procédé et les fonctions de sécurité ainsi que d'un ordinateur permettent la supervision.

Plan d'étude

Le pilote permet de travailler selon neuf différents arrangements de circulation des flux; dans un premier temps, la configuration donnant les meilleures performances a été déterminée (v. *fig. 3*); il s'agissait d'obtenir le meilleur compromis entre le débit d'air traité et la concentration de COV.

Ensuite, des débits d'air variant entre 10 et 30 m^3/h et chargés de 500 à 3000 ppm de dichlorométhane ont été traités. Les pressions nécessaires se situent entre 1,5 à 2 bars.

Méthode analytique

Les concentrations de dichlorométhane dans l'air ont été analysées par chromatographie en phase gazeuse sur colonne

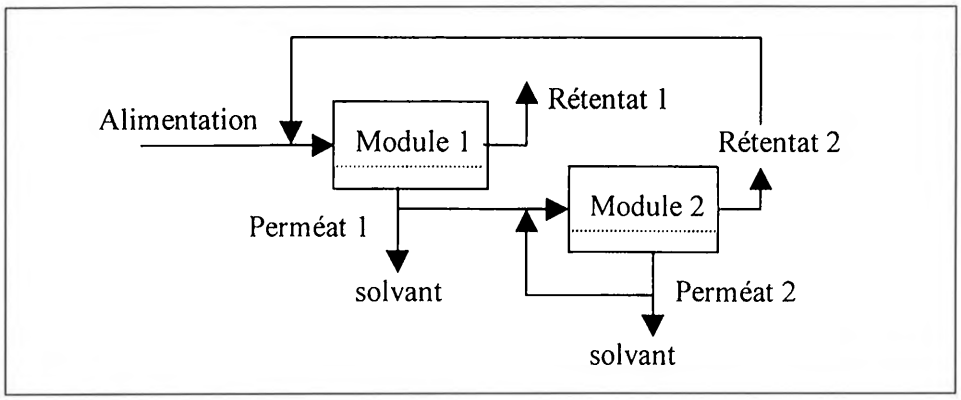

Fig. 3. *Schéma de principe*

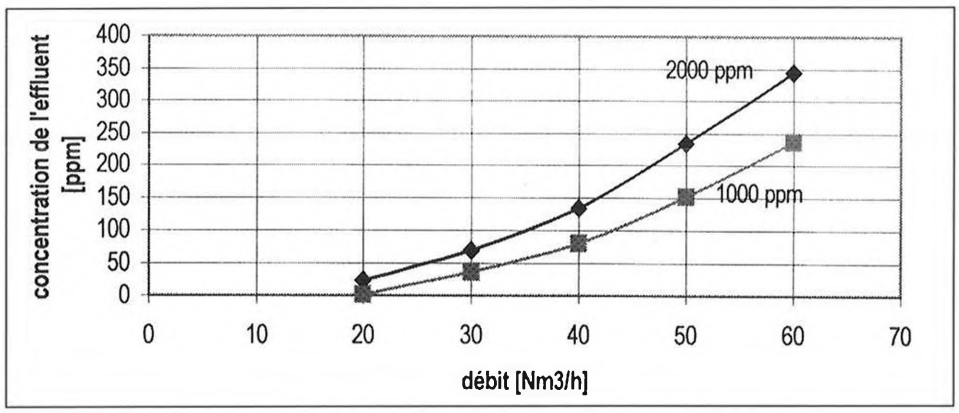

Fig. 4. *Concentration en dichlorométhane de l'effluent en fonction de la concentration d'alimentation*

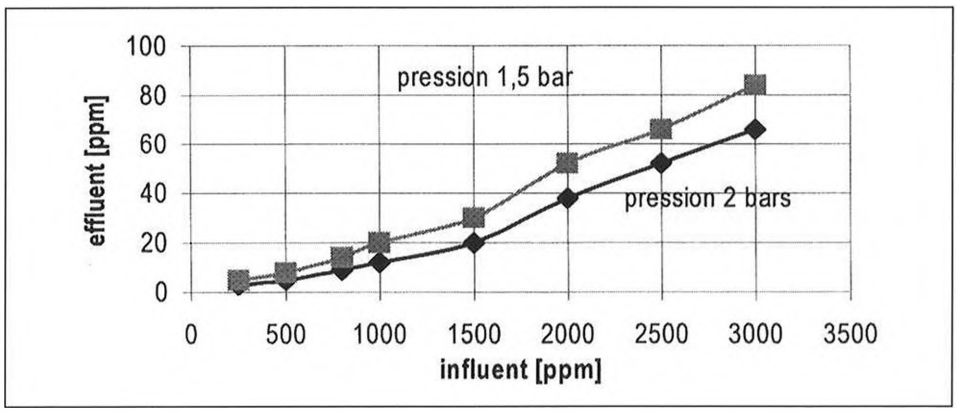

Fig. 5. *Concentration en dichlorométhane de l'effluent en fonction de l'influent*

Carbowax 20M et, pour les concentrations inférieures à 500 ppm, par absorption infrarouge.

Résultats obtenus

La qualité de l'effluent en fonction du débit d'alimentation a été étudiée pour deux concentrations différentes de dichlorométhane: 1000 et 2000 ppm, à une pression de 1,85 bar.

Ensuite, l'étude de la qualité de l'effluent en fonction de la concentration de l'alimentation a fait l'objet de deux séries de mesures pour des pressions de 1,5 et 2 bars et un débit d'entrée de 33 Nm^3/h:

Les opérations effectuées montrent qu'il est possible d'atteindre les faibles concentrations requises par l'ordonnance sur la protection de l'air: on constate que le taux d'épuration diminue avec l'augmentation du débit et avec la concentration de dichlorométhane dans l'alimentation; *e.g.*, pour une alimentation à 3000 ppm, on arrive à obtenir un effluent contenant moins de 100 ppm de dichlorométhane dans un premier étage de traitement; on atteint facilement les 5 ppm requis par les normes avec deux étages.

L'augmentation de la pression a aussi une influence positive sur le taux de séparation.

Applications industrielles possibles

Cette étude ayant été conduite en collaboration avec une industrie chimique, un cas concret d'application a été envisagé, en prenant un réacteur travaillant 8 heures par jour, 200 jours par an, et dans lequel règne une surpression de 40 mbar. Les débits de gaz pollué sortants sont de l'ordre de 10 à 15 m^3/h avec des pointes à 35 m^3/h. Les concentrations en composés organiques volatils se situent entre 15000 et 20000 ppm.

Ces débits sont comparables à ceux traités dans l'installation pilote mais leurs concentrations sont 10 fois plus élevées; on peut donc en première approximation extrapoler linéairement la surface de membrane nécessaire, soit 180 m^2.

Pour ne pas interférer sur les conditions de travail du réacteur, il faut prévoir un réservoir tampon entre l'unité de production et celle de traitement de l'air. L'équipement de perméation comprend un compresseur et une pompe à vide, deux condenseurs, l'instrumentation et les différentes tuyauteries, le tout est monté sur un châssis mobile permettant une intégration facile de l'installation en milieu industriel. L'investissement à prévoir pour une telle unité de traitement d'air se situe à environ CHF 350 000.

Conclusions

L'utilisation d'un procédé à membrane pour épurer des gaz chargés de composés organiques volatils semble être une technique intéressante; elle permet d'atteindre des rendements d'épuration très élevés pour un coût se situant entre ceux d'une installation d'adsorption sur charbon actif et ceux ou d'une incinération.

Les coûts d'exploitation sont sensiblement plus faibles que ceux des autres méthodes de traitement. La durée de vie des membranes devrait se situer à environ 10 ans si les conditions de travail optimales sont respectées (pas de poussières corrosives ou produits incompatibles).

Cette étude pilote va être poursuivie d'abord avec une modernisation du système de commande séquentielle et d'enregistrement des données; pour ce faire, une application du programme Labview est prévue. Ensuite, des mesures avec d'autres solvants (chlorure de méthylène, *e.g.*) et sur un domaine de concentrations plus large pourront être effectuées.

Reçu le 28 juillet 1998

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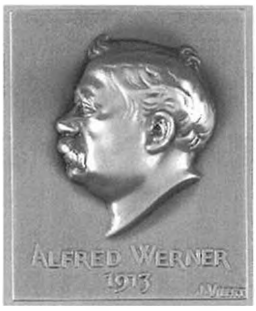
Wissenschaftliche Auszeichnungen der NEUEN SCHWEIZERISCHEN CHEMISCHEN GESELLSCHAFT

Ausschreibung für die Verleihung 1999

Distinctions scientifiques de la NOUVELLE SOCIÉTÉ SUISSE DE CHIMIE

Mise au concours pour 1999



Werner-Preis
Der *Werner*-Preis wird an schweizerische oder in der Schweiz tätige Nachwuchswissenschafter für ausgezeichnete Forschungsarbeiten auf dem Gebiet der Chemie verliehen. Die Auswahl umfasst Kandidaten und Kandidatinnen aus Hochschulen und Industrie.
Die Preisverleihung findet im Herbst 1999 statt.
Einreichefrist: 31. Oktober 1998.

Prix _Werner_
Le prix *Werner* sera attribué à un jeune chercheur suisse ou un jeune chercheur exerçant son activité en Suisse, pour un travail de haute qualité dans le domaine de la chimie. Les candidats et candidates peuvent être issus d'une Haute École ou de l'industrie.
La remise du prix aura lieu en automne 1999.
Délai de présentation: 31 octobre 1998.

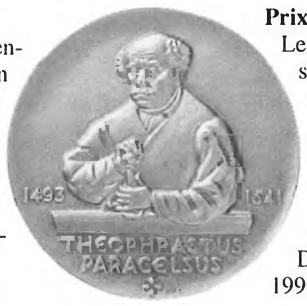
Sandmeyer-Preis
Der *Sandmeyer*-Preis wird für hervorragende Arbeiten auf einem Gebiet der industriellen oder angewandten Chemie an ein Arbeitsteam oder einen Einzelnen verliehen. Die Arbeit soll in der Regel in der Schweiz oder im Ausland von einem Arbeitsteam mit Beteiligung von Schweizer Bürgern und Bürgerinnen ausgeführt worden sein.
Die Preisverleihung findet im Frühjahr 1999 statt.
Einreichefrist: 31. Oktober 1998.

Prix _Sandmeyer_
Le prix *Sandmeyer* sera attribué à un groupe de travail ou à un candidat unique pour un travail de haute qualité dans le domaine de la chimie industrielle ou appliquée. Le travail doit avoir été réalisé en suisse ou à l'étranger par un groupe de travail comprenant des citoyens et citoyennes suisses.
La remise du prix aura lieu au printemps 1999.
Délai de présentation: 31 octobre 1998.

Dr.-_Max-Lüthi_-Preis
Die Dr.-*Max-Lüthi*-Auszeichnung wird für ausgezeichnete Diplomarbeiten verliehen, die an Chemieabteilungen von höheren technischen Lehranstalten der Schweiz ausgeführt werden.
Anträge der Abteilungsvorsteher der Chemieabteilungen müssen bis Ende Dezember 1998 an den Geschäftsführer der NSCG eingereicht werden.
Die Preisverleihung findet im Frühjahr 1999 statt.

Prix Dr.-_Max-Lüthi_
Le prix Dr.-*Max-Lüthi* est attribué à l'auteur d'un travail de diplôme de qualité exceptionelle effectué dans le département de chimie d'une école technique supérieure suisse.
Les propositions des directeurs des départements de chimie des écoles techniques supérieures suisses doivent être soumises à l'administrateur de la NSSC avant la fin décembre 1998.
La remise du prix aura lieu au printemps 1999.

Paracelsus-Preis
Der *Paracelsus*-Preis kann Wissenschaftern, die im internationalen Vergleich Hervorragendes in der wissenschaftlichen Forschung auf dem Gebiet der Chemie geleistet haben, zuerkannt werden.
Der *Paracelsus*-Preis wird das nächste Mal im Herbst 1999 verliehen.
Einreichefrist: 31. Oktober 1998.



Prix _Paracelse_
Le prix *Paracelse* est attribué à des scientifiques qui ont effectué des travaux de recherche exceptionnels et reconnus sur le plan international dans le domaine de la chimie.
Le prix *Paracelse* sera remis la prochaine fois en automne 1999.
Délai de présentation: 31 octobre 1998.

Vorschläge und Bewerbungen sind mit den notwendigen Unterlagen an den Geschäftsführer der NSCG einzureichen.

Propositions et candidatures doivent être adressées à l'administrateur de la NSSC avec un dossier complet.

NEUE SCHWEIZERISCHE CHEMISCHE GESELLSCHAFT
NOUVELLE SOCIÉTÉ SUISSE DE CHIMIE

Dr. H.L. Senti
Präsident/Président
Dr. R. Darms
Geschäftsführer/Directeur

Adresse: c/o Ciba, K-25.1.47
CH–4002 Basel

CHIMIA 52 (1998) Nr. 9 (September)

NEUE SCHWEIZERISCHE CHEMISCHE GESELLSCHAFT

NOUVELLE SOCIETE SUISSE DE CHIMIE

NEW SWISS CHEMICAL SOCIETY

http://sgich1.unifr.ch/NSCS/

Sektion Chemische Forschung Section Recherche Chimique

Jahresversammlung der Mitglieder der Sektion Chemische Forschung
Assemblée annuelle des membres de la Section Recherche Chimique

Donnerstag, 15. Oktober 1998 / Jeudi, 15 octobre 1998
10.45–10.55
ETH Zentrum, Hauptgebäude, Hörsaal E3

Traktanden/Ordre du jour

1. Protocol of the annual meeting of the Section held on October 15, 1997
2. Annual report of the chairman
3. Annual report of the treasurer
4. Election of the committee of the Section for the period 1.1.1999–31.12.2000
5. Election of the chairman of the Section for the period 1.1.1999–31.12.2000
6. Release of the committee and treasurer
7. Membership fees 1999
8. Future activities of the section
9. Miscellaneous

Prof. J. Weber
Chairman of the Section Chemical Research

SGPP Swiss Society for Photochemistry and Photophysics

Grammaticakis-Neumann Prize Winner 1997: Prof. *Axel G. Griesbeck*

The Swiss Society of Photochemistry and Photophysics has awarded the *Grammaticakis-Neumann* Prize 1997 to Prof. *Axel G. Griesbeck*, University of Cologne, Germany. The *Grammaticakis-Neumann Prize* is awarded to young scientists in recognition of excellent research in the field of photochemistry.

Axel G. Griesbeck received his Ph.D. from the *Ludwig-Maximilian* University, Munich, in 1984 under the direction of Prof. *K. Gollnick*, and did postdoctoral studies with Prof. *W. Adam* at the University of Würzburg, Prof. *D. Seebach* at the Swiss Federal Institute of Technology in Zurich and with Prof. *E. Fischer* at the *Weizmann* Institute of Science in Rehovot, Israel. He is presently professor of organic chemistry at the University of Cologne, where he began his academic career in 1987.

The prize was attributed to *Axel G. Griesbeck* 'in recognition of his excellent contributions to the development of photochemical reactions which are useful in organic synthesis and to the elucidation of their mechanisms'.

The article already published in *Chimia* **1998**, *52* (issue 6), 272, is based on the contents of the *Grammaticakis-Neumann* Lecture held by *Axel G. Griesbeck* on the occasion of the Prize Award Ceremony on October 13, 1997.

K. Dietliker, president of the *Grammaticakis-Neumann* Prize Committee

Sektion Industrielle Chemie (SIC)

Kurzbericht zur Mitgliederversammlung mit Firmenbesuch vom 15. Mai 1998 bei *Givaudan Roure* in Vernier (Genf)

Liebe Sektionsmitglieder

Auch die diesjährige Mitgliederversammlung der Sektion Industrielle Chemie konnte wieder im Rahmen eines Firmenbesuches abgewickelt werden. Wir genossen dieses Jahr Gastrecht bei *Givaudan Roure* in Genf, wo wir durch unser Vorstandsmitglied Dr. *Christian Salomon*, in der Funktion als Leiter dieses Werkes, herzlich willkommen geheissen wurden. Dr. *Salomon* stellte uns seinen Betrieb im Rahmen einer Präsentation vor und führte die Anwesenden, die in der überwiegenden Zahl mit der Welt der Aromen und Düfte wenig vertraut waren, in diese spezifische Sparte der industriellen Produktion von Chemieprodukten ein.

Givaudan kann in Vernier 1998 das 100. Jahr der Firmengeschichte feiern und wir gratulieren auch seitens unserer Sektion für diese langjährige, erfolgreiche Industrietätigkeit und wünschen unseren Kollegen auch für die Zukunft eine gute Nase in der Weiterentwicklung des Geschäftes.

Im Rundgang, der anschliessend an die Mitgliederversammlung durchgeführt wurde, konnten wir die Produktionsanlagen einer Besichtigung unterziehen. Hierbei beeindruckten uns vor allem die spezifischen Mischtechnolgien, die in der Lage sind, für eine Vielzahl von Rezepturen die entsprechenden Produkte weitgehend automatisch herzustellen.

Die Mitgliederversammlung wurde zum letzten Mal von unserem 'Gründungspräsidenten' Dr. *Hans Luzius Senti* geleitet. Er war einer der zentralen Exponenten, die mit ihrer Initiative zur Verwirklichung einer neuen Sektion für Industrie- und Entwicklungschemiker im Rahmen der NSCG beigetragen haben. Wir möchten an dieser Stelle Dr. *Senti* für sein Wirken und seinen Einsatz unsere Anerkennung und unseren Dank aussprechen. Da er nun nach seiner Pensionierung neu das Präsidium der NSGC übernommen hat, wird er uns in übergeordneter Instanz erhalten bleiben und kann als Kenner der Industriellen Chemie uns weiterhin unterstützen.

Aus dem **Jahresrückblick des Präsidenten** seien folgende Schwerpunkte zitiert:

- Der Vorstand hat in seinen Sitzungen primär Fragen betreffend zukünftiger Weiterentwicklung der Sektion, Bedürfnisse der Mitglieder bez. Information, Aus-/Weiterbildung, zukünftigen Themen für Symposien und Veranstaltungen, Organisation der Mitgliederversammlung kombiniert mit Besichtigungen und die Vergabe des *Sandmeyer*-Preises diskutiert. Es wird nun Aufgabe der nächsten Zeit sein, gute Ideen in die Tat zum Nutzen unserer Mitglieder umzusetzen.
- Im vergangenen Jahr 1997 konnte die Mitgliederversammlung im Rahmen der 100-Jahr-Feier der Firma *LONZA AG* in Visp durchgeführt werden. Diese Veranstaltung bot gleichzeitig die Gelegenheit zum Besuch eines Symposiums zum Thema 'Industrielle asymmetrische Synthesen' mit namhaften in- und ausländischen Referenten zu diesem Thema und einem Rundgang in den vielfältigen Anlagen des Werkes Visp. Die Unkosten der Veranstaltung wurden durch die *LONZA AG* getragen, und wir verdanken diese Grosszügigkeit recht herzlich der Gastgeberfirma.

– Ein gewisses Sorgenkind stellt der *Sandmeyer*-Preis dar. Dieser wird seit 1993 verliehen und ist noch zuwenig bekannt. Wir ermuntern die Mitglieder, in ihrem Tätigkeitsumfeld preiswürdige Teamarbeiten zu identifizieren und dem Preiskomitee einzureichen (vgl. auch Ausschreibung in *Chimia* **1998**, *52* (6), 295).

Der **Kassenbericht 1997** wurde in gewohnt kompetenter Weise von Dr. *Kurt Käser* vorgetragen. Die Finanzlage gestattet uns eine Rückstellung vorzunehmen, die für zukünftige Aktivitäten eingesetzt werden kann. Interessierte können die Jahresrechnung direkt beim Kassier einfordern.

Der Revisor, Dr. *Joyeux*, bestätigte die korrekte Rechnungsführung. Die Versammlung konnte damit dem Kassier einstimmig Entlastung erteilen und die Arbeit mit Applaus verdanken.

Das **Budget 1998** rechnet mit einem Aufwand von *ca.* CHF 27700.–.

Es wird einstimmig beschlossen, den Sektionsbeitrag von CHF 20.– (zusätzlich zum Beitrag von CHF 100.– für die Mitgliedschaft in der NSCG) beizubehalten.

Der Vorstand musste sich im laufenden Geschäftsjahr verständlicherweise intensiv mit der Vorbereitung des **4. Freiburger Symposiums mit dem Thema 'Industrielle Produktion mit hochreaktiven Stoffen'** beschäftigen. Die einzelnen Themen wurden durch Dr. *Käser* der Versammlung kurz vorgestellt. Wir rechnen mit einem Aufwandbudget von rund CHF 70000.–. Dieses Symposium setzt den Schwerpunkt im laufenden Jahr. Wir hoffen auch diesmal eine Veranstaltung organisieren zu können, die auf entsprechendes Interesse stösst. **Wir ermuntern die Mitglieder zur Teilnahme und zur Bekanntmachung der Ausschreibung im Kreis von Kolleginnen und Kollegen.**

Das alle zwei Jahre notwendige **Wahlgeschäft** konnte speditiv abgewickelt werden. Als neues Vorstandsmitglied wurde vorgeschlagen:

Dr. *Christian Favez*, Directeur usine de la plaine, *Firmenich SA* Genève.

Für den zurücktretenden Präsidenten Dr. *H.L. Senti* erklärt sich der Schreibende, Dr. *H.R. Dettwiler*, bereit, neu das Amt des Präsidenten der Sektion SIC zu bekleiden.

Beide Herren wurden durch Akklamation in ihren neuen Funktionen bestätigt und die bisherigen Vorstandsmitglieder einhellig wiedergewählt.

Der Vorstand ist der Meinung, dass allenfalls noch zwei weitere Vorstandsmitglieder, insbesondere von noch nicht vertretenen namhaften Schweizer Chemiefirmen, im Vorstand vertreten sein sollten. Entsprechende Kontakte müssen in nächster Zukunft geknüpft werden.

Im Anschluss an Mitgliederversammlung und Werksrundgang konnte im Rahmen eines ausgezeichneten Mittagsbuffets auch der firmenübergreifenden Fachdiskussion Raum geboten werden. Wir verdanken *Givaudan Roure* die Gastfreundschaft recht herzlich und hoffen uns im nächsten Jahr in einer ähnlich angenehmen Umgebung wieder treffen zu können.

H.R. Dettwiler

Neue Mitglieder

Battaglia, Reto, Dr., 8031 Zürich

Deschamps, Nathalie, 8057 Zürich

Dill, Bernd, Dr., 4133 Pratteln

Eliasson, Baldur, Dr., 5413 Birmenstorf

Gaillard, Cédric, F–13003 Marseille

Gamp, Eduard, Dr., 8605 Gutenswil

Herm, Christoph, Dr., 8032 Zürich

Hesford, Frank, 8820 Wädenswil

Hoffner, Johannes, 8053 Zürich

Holzer, Philipp, 4125 Riehen

Luisi, Pier Luigi, Prof. Dr., 8006 Zürich

Manetsch, Roman, 4055 Basel

Martinez Perez, Jose Antonio, 4056 Basel

Mindt, Thomas, 4142 Münchenstein

Ratni, Hassen, 1205 Genève

Rebetez, Michel, 3902 Brig-Glis

Schönleber, Ralph, 4056 Basel

Tornare, Jean-Marc, Dr., 1870 Monthey

Tuchscherer, Gabriele, Dr., 1015 Lausanne

Vanoli, Ennio, 1705 Fribourg

Wehrli, Adolf, Dr., 5070 Frick

Yeng, Yoeng Boh, Dr., 81200 Johor Balu, Malaysia

INFORMATION

Federation of European Chemical Societies

Annual Report 1997

The Federation of European Chemical Societies is a voluntary association, the object of which is to promote cooperation in Europe between those nonprofit-making scientific and technical societies in the field of chemistry whose membership consists largely of individual qualified chemists and whose interests include the science and/or practice of chemistry. It was founded in 1970.

A Powerful Voice for Chemists and Chemistry

The Federation of European Chemical Societies (FECS), with the European Communities Chemistry Council (ECCC), through about 50 member societies together represent some 200000 individual chemists in academia, industry and government in Europe.

The Structure of FECS

The scientific work of FECS is carried out through its Divisions (Analytical Chemistry, Food Chemistry, Chemical Education) and Working Parties. The EUCHEM Committee, operating within FECS, organises high-level conferences and advises the European Science Foundation on its chemistry conferences. The European Communities Chemistry Council (ECCC), reconstituted in 1996 in association with FECS, was founded in 1973, its primary object being to act in an advisory or representative capacity in matters relating to the science and practice of chemistry, particularly in relation to the European Commission.

The FECS Lecture 'Farbenspiel einer Ionenpumpe' (Colour changes of an ion pump) was given by Prof. *Dieter Oesterhelt*, Max-Planck-Institut für Biochemie, in September in Vienna during the 100th anniversary meeting of the Gesellschaft Österreichischer Chemiker.

The Award for Service to FECS was presented to Prof. *Erno Pungor*, Hungary, one of the founders and former Chairman of the Working Party on Analytical Chemistry.

The General Assembly of FECS met on September 11–12 in Vienna as the guests of the Gesellschaft Österreichischer Chemiker.

Divisions

Analytical Chemistry

Plans were made to launch the textbook on analytical chemistry in March 1998. A Who's Who in analytical chemistry in Europe is being prepared to help the ACTIVE and other student exchange programmes. Eurocourses planned include a joint Euro-American-Japanese course in Vienna in July 1998, courses on quality matters and on micro total analysis systems.

Much work is being undertaken in quality assurance and accreditation. The history of the Division will be published to mark its 25th anniversary in 1997.

The proceedings of Euroanalysis IX held in Bologna in 1996, with 700 participants, have been published in *Annali di Chimica, the Journal of Analytical and Environmental Chemistry* **1997**, *87*. Euroanalysis 10 will be held in Basel on September 6–11, 1998.

Food Chemistry

Conferences organised during 1997 included: 'Alimentacao Mediterranica' in Algarve in March;

'Bioavailability III' in Wageningen in May; 'In Vino Analytica Scientia' in Bordeaux in June; 'Laboratory Quality Assessment Issues' Roundtable at AOAC meeting in US in September, 'EUROFOOD-CHEM IX' in Interlaken in September. The roundtable on 'Laboratory Quality Assessment Issues' at the AOAC international meeting in San Diego continued the development of a close relationship between the Division and AOAC international.

Conferences in 1998: 'Structure and Functionality of Food Products' in Mrogowo in May; international symposium on immunology, 'Chemical and Clinical Problems of Food Allergy', in Taormina in October. The publication *Food Chem Window* provides a compendium of student exchange programmes involving 36 research groups in 17 countries.

The second edition of the successful *Who's Who in Food Chemistry – Europe* will be extended to include relevant consulting/analytical/service laboratories.

Chemical Education

The 4th European Conference on Research in Chemical Education (ECRICE) was held in York in September. Plans were made for the 1st European Conference in Chemical Education (ECCE) in Budapest in September 1998 for practitioners of chemical education at degree level. The 1998 FECS Lecture entitled *'Using the results of chemical education research'* will be delivered by Prof. *Alex H. Johnstone*, University of Glasgow, Scotland, on August 28 during ECCE.

A special edition of *International Journal of Science Education* in 1998 will publish papers illustrating current chemical education research activity in Europe.

Working Parties

Chemistry and the Environment

FECS societies have demonstrated increased interest in FECS activity in chemistry and the environment.

Plans were made for the conference 'Atmospheric Chemistry and Air Pollution' in Copenhagen on August 26–28, 1998. There is cooperation with the Italian Chemical Society in the planning of symposia for the conference 'Water in the Mediterranean Area, Conference on Quality and Quantity of Mediterranean Water Resources' in Sardinia on October 11–18, 1998.

An association with the journal *Environmental Science and Pollution Research* assists publicity – Internet:

http://www.ecomed.de/naturw/bereiche/titel/espr/welcome.htm

Plans were made to compile major textbooks in environmental chemistry. Contacts were developed with the European Environment Agency.

Computational Chemistry

The 2nd European Conference on Computational Chemistry (EUCO-CC2) was held in Lisbon in September, with about 200 participants. Plans are being made to organise a series of biannual summer schools on computational chemistry, the first being in Perugia, Italy, in 1999.

Organometallic Chemistry

The XIIth FECHEM Conference on Organometallic Chemistry was held in September in Prague with 400 participants from 35 countries, including 120 students. The booklet *Organometallic Research Centres in Europe* contains details of over 2000 European organometallic chemists:
http://wwwtw.vub.ac.be/ond/aosc/eoc/default.htm

History of Chemistry

The third edition of the highly successful *Guide for Museums with collections on History of Chemistry and of Pharmacy* has been published. Preliminary plans are being made for publishing a history of European chemical societies.

Chemistry in the Conservation of the Cultural Heritage

A programme has been launched to compile a 'Data Bank on Conservation Procedures of Stone, Metals, Paintings'. Forms of this purpose have been published in *Science and Technology for Cultural Heritage* **1997**, *6* (1), edited by CNR, Rome. A first set of data on conservation of monumental buildings are compiled in an interactive data bank. Conservation organisations in Italy have adopted the forms.

Electrochemistry

Plans were made for a meeting on 'Electrified Interfaces' in Porto on July 5–10, 1998, to consider the structure and dynamics of the solid/electrolyte interface. Contact were developed with the European Commission to discuss relevant aspects of the Framework Programme V. The development of a Eurocurriculum on electrochemistry is underway.

European Communities Chemistry Council

The ECCC comprises national societies, both learned societies and professional associations, representing 150000 chemists, of whom 50% are under 35 years old.

The Designation European Chemist – EurChem

The professional designation European Chemist (EurChem) is open to members of FECS member societies. European Chemist denotes academic qualification plus approved professional experience. There were 656 European Chemists at the end of 1997. The category-A schedule of qualifications lists the approved academic qualification requirements for candidates. Schedules of category-B and -C level qualifications are also maintained.

Ph.D. Training

Collaboration with CEFIC led to a highly successful joint seminar on Ph.D. training in chemistry in Europe, with contributions from senior representatives of academia and industry and the European Commission. Participants considered how the providers of Ph.D. training could best respond to the challenges of the future.

SATW Schweizerische Akademie der Technischen Wissenschaften

Eine öffentliche Tagung über Life Sciences EPF Lausanne, 24./25. September 1998

Die Schweizerische Akademie der Technischen Wissenschaften veranstaltet am 24. und 25. September 1998 an der Ecole polytechnique in Lausanne eine öffentliche Tagung über das neue Gebiet der Life Sciences. Dieses ist gekennzeichnet durch das Zusammenwirken zahlreicher Disziplinen der medizinischen, der technischen und der Naturwissenschaften zum Wohl der Menschen. Durch das Zusammengehen der Life Sciences mit dem Wissen der Ingenieure ergeben sich für die Zukunft in den Grenzgebieten von Medizin, Materialwissenschaften und Informatik interessante neue Chancen. Diese Frage steht mit Blick auf die Tätigkeit des Ingenieurs im Vordergrund der Tagung.

Anhand von Vorträgen und Firmenpräsentation erhalten die Besucher einen vertieften Einblick in die zukünftige Entwicklung im Bereich der daran beteiligten Wissenschaften. Themen die zur Sprache kommen sind u.a. die Biomaterialien, Gen-Chips und Gewebezüchtung. Service und innovative Technologie für die Pharma- und Agroforschung werden ebenfalls erläutert. Am Freitag ist der Besuch des Forschungszentrums von *Nestlé* und der Laboratorien von *Ares-Serono* vorgesehen.

Anmeldefrist: 31. 8. 1998.
Tagungsbeitrag: CHF 50.–

Ehrungen

Prof. Dr. *Duilio Arigoni*, emeritierter Professor der ETH-Zürich für Organische Chemie, ist in die National Academy of Sciences, USA, gewählt worden.

Dr. *Thomas Carell*, Laboratorium für Organische Chemie der ETH-Zürich, ist von der Arbeitsgemeinschaft Deutscher Universitätsprofessoren für Chemie, ADUC, für seine Arbeiten zur Simulation und Aufklärung der DNA-Reparaturreaktion von DNA-Photolyasen der ADUC-Jahrespreis für Habilitanden verliehen worden.

Prof. Dr. *Dieter Seebach*, Laboratorium für Organische Chemie der ETH-Zürich, ist von der Schweizerischen Akademie der Technischen Wissenschaften als Einzelmitglied aufgenommen worden. Die Ernennung ist in Würdigung seiner grundlegenden Beiträge zur organischen Chemie und seiner Verdienste um die technische Realisation der Ergebnisse erfolgt.

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Second Swiss/German Meeting on Medicinal Chemistry

Monday–Tuesday, March 22–23, 1999
Zentrum für Lehre und Forschung, Hebelstrasse 20, Basel

Organised by the Section of Medicinal Chemistry of the New Swiss Chemical Society,
the Fachgruppe für Medizinische Chemie of the GDCh
and the Chemical Society Basel,
with support from the Pharmaceutical Industries of Basel

Monday, 22 March, 08.45

Opening of the Symposia by Prof. Dr. *Gerd Folkers*, Chairman of the Scientific Committee

Monday, March 22, 09.00–12.00

Mini-Symposium on Virology, Chairman Dr. *Michael Bös*

The Discovery of Crixivan®, an Orally Bioavailable HIV-1 Protease Inhibitor, *Dr. Joseph P. Vacca*,
Senior Director of Medicinal Chemistry, Merck Research Laboratories, West Point, PA, USA
Title will be communicated later, *Dr. P.W. Smith*, Group Leader, Glaxo Wellcome Research and Development, Stevenage, Hertfordshire, UK
Title will be communicated later, Prof. Dr. *George M. Whitesides*, Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, USA

Monday, March 22, 14.00–17.00

Mini-Symposium on Multidrug Resistance, Chairman Prof. Dr. *Joachim Seidl*

Multidrug Resistance from Bacteria to Men: Similarities in Structure and Function,
Prof. Dr. *W.N. Konings*, University of Groningen, Dept. of Microbiology, A.A. Haren, The Netherland
Modulation of Multidrug Resistance in Cancer Cells by Inhibitors of P-Glycoprotein, Prof. Dr. *Ahmad R. Safa*, Department of Experimental Oncology, Medical University of South Carolina, Charleston, SC, USA
Impaired Accumulation of Drug in Multidrug Resistant Cells. What are the Respective Contributions of the Kinetics of Uptake and of Transporter-Mediated Efflux of Drug?, Prof. Dr. *Arlette Garnier-Suillerot*, Laboratoire de Physico-chimie Biomoléculaire et Cellulaire, Université Paris Nord, Bobigny, France

Tuesday, March 23, 08.30–11.15

Mini-Symposium on Immunology, Chairman Dr. *Rainer Metternich*

The Design of IMPDH Inhibitors, Dr. *Mark A. Murcko*, Vertex Pharmaceuticals Inc., Cambridge, MA, USA
Regulation of Intracellular Signal and Transcription by Induced Proximity Using Synthetic Ligands,
Prof. Dr. *Gerald R. Crabtree*, Stanford Univ. Med. Sch., Stanford, CA, USA
Derivation of the Immunosuppressive Macrolide Rapamycin: Chemical, Structural and Biological Aspects,
Dr. *Richard Sedrani*, Novartis Pharma AG, Basel, Switzerland

Tuesday, March 23, 14.00–17.00

Mini-Symposium on Gene Therapy, Chairman Prof. Dr. *Jürgen Engel*

Somatic Cell and Gene Therapy: Perspectives in Oncology, Prof. Dr. *Roland Mertelsmann*, Chairman Dep. of Medicine, Uni Freiburg, Germany
Title will be communicated later, Prof. Dr. *Claudio Bordignon*, Director Gene Therapy and Cell Transplantation Program, Fondazione Centro S. Raffaele Del Monte Tabor, Milano, Italy
Sugar- and Base-Modified Oligonucleotides for the Sequence-Specific Recognition of Single- and Double-Stranded RNA and DNA, Prof. Dr. *C.J. Leumann*, Institute of Organic Chemistry, University of Bern, Switzerland

Scientific Committee
SMC: Dr. Michael Bös, Prof. Dr. Gerd Folkers (Chairman), Dr. Rainer Metternich
GDCh: Prof. Dr. Jürgen Engel, Prof. Dr. Joachim Seidl

Organising Committee
SMC: Prof. Dr. Alex Eberle, Dr. Wolfgang Froestl, Dr. Rudolf Giger
BCS: Prof. Dr. Hanspeter Huber

No reservation necessary, entry free.

Additional Information in due time: http://sgich1.unifr.ch/smc/SwiGer99.htm

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Die Neue Schweizerische Chemische Gesellschaft trauert um ihr Ehrenmitglied

Prof. Dr. George H. Büchi

1. August 1921 – 28. August 1998

Eine ausführliche Würdigung des Verstorbenen wird in einer späteren CHIMIA-Ausgabe erfolgen.

Ehrungen

Ahmed Zewail Honoured with the *Paul Karrer Medal*

On June 24, 1998, Prof. *Ahmed Zewail* was awarded the *Paul Karrer* Medal, presented by the Rector of the University of Zürich in the main auditorium.

Ahmed Zewail, currently the *Linus Pauling* Professor of Chemistry and Professor of Physics at the California Institute of Technology, was honoured for his contributions to the understanding of the 'Dynamics of the Chemical Bond'. He and his coworkers pioneered what is referred today as 'femtosecond chemistry', in which the dynamics of a chemical reaction are followed on a timescale shorter than the period of vibrational motion executed by an atom within a molecule. Using femtosecond (10^{-15} s) laser flashes, ultrafast measurements opened the window to a microscopic world, which allows us to 'see' the making and breaking of chemical bonds. The results of Prof. *Zewail*'s ingenious experiments have greatly extended and deepened our understanding of how molecules undergo chemical change. On this ultrafast timescale, processes such as intramolecular vibrational energy redistribution, chemical reaction rates, and transition-state dynamics can be closely followed. He illustrated these mechanistic features on prototypical chemical and biochemical systems in the gas phase, in clusters, and in the condensed phase.

It therefore appears that by his beautiful and innovative studies of the dynamics of the chemical bond Prof. *Zewail* has brought us close to

the 'end of the race against time' – at least in the realms of chemistry and biology.

Following the award, Prof. *Zewail* presented the *Paul Karrer* lecture with the title 'Chemistry and Biology in the Femtosecond Age', focussing on organic reaction systems. Specifically, he presented to the audience his results on pericyclic addition and cleavage, and elimination, *Diels-Alder*, *Norrish*, and tautomerization reactions. He closed this fascinating lecture by presenting his most recent 'snapshots' of the dynamics of the molecular structure during a chemical reaction using ultrafast electron pulses.

J. Robert Huber
Physical Chemistry Institute
University of Zürich

Neue Bücher

Bei der Redaktion eingetroffene Bücher

Y. Chapleur (Ed.)
'Carbohydrate Mimics'
Wiley-VCH, 1998

G. Ertl, H. Knözinger, J. Weitkamp (Eds.)
'Handbook of Heterogenous Catalysis', Vol. 1–5
Wiley-VCH, 1998

L.W. Mander
'Stereoselektive Synthese'
Wiley-VCH, 1998

K.-H. Hellwich
'Chemische Nomenklatur'
Govi-Verlag Pharmazeutischer Verlag, 1998

Vorträge

Novartis Chemistry Lectureship 1998/1999

Mittwoch, 10.30 Uhr
Auditorium Horburg, K-430.3.20
Müllheimerstrasse, Basel

7. Oktober 1998	Prof. *Andrew B. Holmes* Cambridge University, UK 'Pericyclic processes in the synthesis of biologically active natural products'
4. November 1998	Prof. *Paul Knochel* Philipps University Marburg, FRG 'New chemo- and stereoselective reactions using polyfunctional organometallics'
2. Dezember 1998	Prof. *Greg C. Fu* MIT, Cambridge, USA 'Asymmetric catalysis with planar-chiral heterocycles'
13. Januar 1999	Prof. *Scott D. Rychnovsky* UC Irvine, USA 'Structure and reactivity of anion, cation and radical intermediates in 1,3-dioxane rings: applications to total synthesis'
3. Februar 1999	Prof. *Mark Lautens* University of Toronto, CND 'New catalytic asymmetric reactions and their application to the synthesis of bioactive compounds'
3. März 1999	Prof. *Philippe Renaud* University Fribourg, CH 'Radical reactions in asymmetric synthesis'
7. April 1999	Prof. *Barry M. Trost* Stanford University, USA 'Catalysis for enhanced synthetic efficiency'
5. Mai 1999	Prof. *Hisashi Yamamoto* Nagoya University, Japan 'Designer *Lewis* acids for selective organic synthesis'

The *Novartis* Chemistry Lectureship is set up to recognize the outstanding contributions of academics in natural product synthesis and the development of synthetic methodology.

Institut de Chimie, Université de Neuchâtel

Avenue de Bellevaux 51, Neuchâtel

Mercredi 28.10.1998 Petit Auditoire 10.30 h	Prof. *B. Giese* Institut für Organische Chemie, Universität Basel Titre va être communiqué

Reagentless Continuous Analysis, 'LAB in the BAG'

In Analytical Chemistry, enormous advances have been made during the last 40 years. A high standard of analytical techniques have been developed with detection limits close to the level of measuring single molecules. Nevertheless, reagentless, truly continuous analytical methods have been a missing link in the spectrum of analytical techniques. UV/VIS-, IR-, NIR- and NMR-spectroscopy are excluded. However, these techniques are expensive and need energy- and space-consuming equipment. As an alternative, FIA-technology has been promoted, and is widely used, although 'flow-injection analysis' works with reagents, traditional wet chemistry and space-consuming instrumentation. Continuous analysis by chemical sensors fills the gap between traditional analytical techniques and single-use teststrip-like technology.

Continuous monitoring is especially attractive in food technology, biotechnology, process and quality control, and in the medical field. It is attractive for processes which run at high speed or run into an uneconomical state, and for processes which need an immediate analytical or diagnostic answer. Immediate monitoring of specific compounds with a low investment of manpower and energy is important in quality control, environmental processes and in many other fields.

Reagentless, continuous analysis is based on thermodynamically reversible chemical sensing principles and steady-state conditions for enzymatic biosensors. Following the basic theories, the sensor responds to increasing and decreasing concentrations of an analyte in a specimen. The specimen may be a gas or a solution. The basics of these analytical principles and measuring techniques will be discussed in the **Course in Sensor Technology on Thursday October 29th, 1998**.

The Centre for Chemical Sensors/Biosensors and bioAnalytical Chemistry (CCS) is developing chemical sensors and biosensors for real-time monitoring of a broad spectrum of analytes. In multidimensional analysis, each analytical parameter represents a vector which opens a multidimensional diagnostic space, and allows typical diagnostic patterns to be interpreted. Alternatively, monitoring of single analytes such as organic amines, alcohols, ammonia etc. enables continuous long-term investigations, and immediate detection of changes in the concentration. For these techniques, the delay-time given by the connection between specimen (source) and sensing layer is relevant.

The **Course in Sensor Technology** addresses people from R&D, sales, and service laboratories, universities and government. Basic principles of reagentless, continuous analysis are addressed: monitoring of heavy metals, organic and inorganic anions and cations, gas analysis, and specific substrates (food- and biotechnology). Strategies, trends and developments are discussed. Analytical techniques are demonstrated in the research laboratory, commercial suppliers are involved. Knowledge in natural sciences is required.

One-day Course

Reagentless Continuous Analysis by Chemical Sensors / Biosensors

29th October 1998

For information please contact:
Samuel Nagel, Centre for Chemical Sensors,
ETH Technopark, CH-8005 Zurich
tel.:++41 1 445 12 34, fax.:++41 1 445 12 33
e-mail: snagel@chemsens.pharma.ethz.ch
internet home page: http://www.chemsens.ethz.ch

Centre for Chemical Sensors / Biosensors
Assoc. Prof. Ursula Spichiger

CCS

Für Ihre Werbung und Stellenangebote in CHIMIA:

KRETZ AG
Verlag und Annoncen
General Wille-Strasse 147, Postfach
CH–8706 Feldmeilen
Telefon 01 923 76 56
Telefax 01 923 76 57

CHIMIA 52 (1998) Nr. 9 (September)

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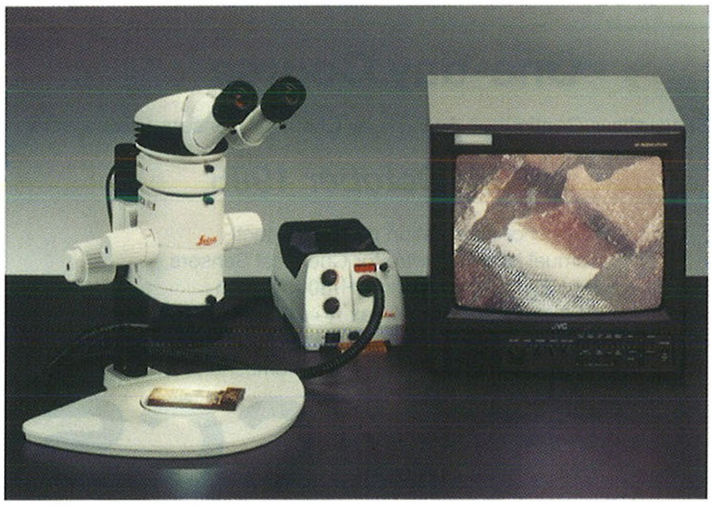
Richten Sie Ihre Beiträge für die Rubrik CHIMIA-REPORT nicht an die Redaktion, sondern ausschliesslich an: Kretz AG, Postfach, CH-8706 Feldmeilen Besten Dank!

LEICA ICA: Integriertes Videomodul für Leica Stereomikroskope



Immer mehr Stereomikroskope werden heute mit Videokameras, TV-Monitoren, Videoprintern und Recordern ausgerüstet. Aus gutem Grund: Die Möglichkeit, Bilder im Monitor zu beobachten und aufzuzeichnen, erweitert den Anwendernutzen enorm. Und zwar in ergonomischer Hinsicht wie in der Vielfalt der Verwendung. Mit dem neuen LEICA ICA bietet Leica ein videomodul der High-End-Klasse an, mit dem sich Arbeitsplätze ergonomisch und preisgünstig ausrüsten lassen. Für die industrielle Qualitätskontrolle und die bildliche Analyse von Schnittpräparaten in den Naturwissenschaften, aber auch für die Ausbildung und Präsentationen vor grossen Zuschauergruppen an Schulen und Universitäten eröffnet das LEICA ICA neue Perspektiven.

Das Videomodul wird ohne zusätzlichen Video/Fototubus direkt zwischen Optikträger und Binokulartubus eingesetzt. Exakt auf das Design der Stereomikroskope LEICA MS5, MZ6, MZ8, MZ12, MZAPO und MZ FLIII abgestimmt, ermöglicht es ungehindertes Arbeiten am Stereomikroskop. Zusammen mit den ErgoTuben™ aus dem Leica Ergonomieprogramm ergibt sich eine kompakte Einheit für ein abwechslungsweises dreidimensionales Beobachten im Binokulartubus und ein okularunabhängiges Betrachten im TV-Monitor. Die konzentrische Einkoppelung in den Strahlengang des Stereomikroskops garantiert beste Bildqualität bis zum Bildschirmrand und eine reflexfreie Abbildung im Binokulartubus. Bildausschnitt und Schärfe auf dem Monitor und in den Okularen stimmen überein. Das Bildzentrum bleibt auch beim Zoomen konstant in der Mitte.

Bei der elektronischen Bildherstellung fallen nicht nur mehrere Produktionsschritte der konventionellen Fotografie weg, sie entspricht auch dem Trend zu umweltschonenden Verfahren. Das Bild kann auf dem Monitor kontrolliert und nach Wunsch korrigiert werden, wobei das Resultat dank Videoprinter jeweils sofort zur Verfügung steht.

Das Videomodul LEICA ICA ist in Bezug auf Schärfe, Helligkeit und Farbeindruck optimal für Mikroskopiezwecke justiert. Dabei kann der Benutzer mit den von Leica definierten Grundeinstellungen arbeiten oder das Bild nach eigenen Vorstellungen gestalten. Die Bedienung über vier Tasten direkt am Videomodul und der Anzeige auf dem TV-Monitor ist äusserst einfach.

- Leica Mikroskopie Systeme AG
  Kanalstrasse 21
  CH-8152 Glattbrugg
  Telefon +41 1 809 33 33
  Telefax +41 1 810 79 37
  Internet www.leica.com

Leserdienst Nr. 2

11. September 1998: 50 Jahre Danfoss Werner Kuster AG

Als sich Werner Kuster im Jahre 1948 mit seinem schweren Musterkoffer auf den Weg zu seinem ersten Kunden machte, war ein entscheidender Schritt zum Erfolg der Firma Danfoss Werner Kuster AG getan.

Der 1970 verstorbene Firmengründer legte grössten Wert auf persönliche Zuverlässigkeit und Dienst am Kunden, Ziele, denen sich die mittlerweile 107 Mitarbeiter der Tochterfirma des dänischen Danfoss-Konzerns heute ebenso verpflichtet fühlen wie die Gründergeneration vor 50 Jahren.

Vieles hat sich bei der Danfoss Werner Kuster AG in den 50 Jahren verändert. Das thermostatische Heizkörperventil, damals noch völlig unbekannt, hat heute unter dem Synonym 'Danfoss-Ventil' die Heizungstechnik in der Schweiz revolutioniert und der hohe Standard der Regelgeräte für die Kältetechnik wurde von der Firma wesentlich mitbestimmt.

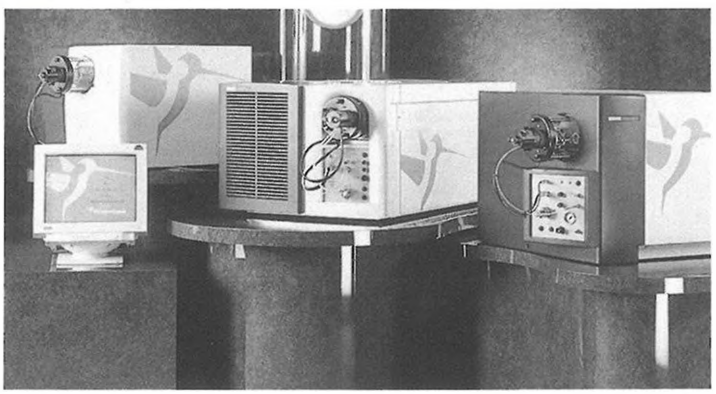
Die Elektronik hat bei den Danfoss-Produkten der Antriebs- und Messtechnik Funktionen übernommen, die zur Zeit der Gründung des Unternehmens undenkbar waren. Innovativ war man im Danfoss-Konzern immer. Während z.B. vor 30 Jahren hydraulische Antriebs- und Steuergeräte nur mit Öl betrieben werden konnten, sind heute Danfoss-Hydraulikmotoren und Regler auch für Wasser als Antriebsmedium lieferbar, eine umweltschonende und saubere Lösung z.B. in der Nahrungsmittelindustrie. Danfoss mit wegweisenden Entwicklungen an führender Stelle immer mit dabei.

Die Danfoss Werner Kuster AG in Frenkendorf, Lausanne und Wallisellen ist seit 50 Jahren ein wichtiges Glied der weltumspannenden Danfoss-Familie und will auch in Zukunft ein kompetenter Partner für den Verkauf und Service anspruchsvoller technischer Regelgeräte sein.

- Danfoss Werner Kuster AG
  Parkstrasse 6
  CH-4402 Frenkendorf
  Telefon 061 906 11 11
  Telefax 061 906 11 21

Leserdienst Nr. 3

Evaluation of Drug Discovery/Development Systems from Micromass



In 1998 Micromass introduced a new family of LC-MS workstations featuring ZSPRAY™ ion source technology and on-line LC-MS exact mass measurement capability. Optimised for intensively automated pharmacokinetic studies, ZSPRAY™ fully satisfies the pharmaceutical industry's criteria for a robust API LC-MS interface with uncompromised sensitivity. Furthermore, its easily accessible open architecture simplifies the system's operation with NanoFlow ES – the analytical technique preferred by proteome investigators in the biopharmaceutical sector.

This year Micromass' proven orthogonal acceleration time-of-flight technology has been refined

into a benchtop drug discovery workstation with the LCT™ 'Walk-Up' Exact Mas LC-MS. The new system can be configured for 'open access' LC-MS with the power of exact mass measurement to provide chemists with elemental composition data.

Also new for 1998 is an expanded range of autopurification/fraction collection systems with greatly enhanced sample loading capacity and flexibility, known as FractionLynx™. Quattro LC is ZSPRAY™ enabled for '98; the pharmaceutical industry's triple quadrupole has been enhanced with Micromass' quantum leap in API ion source technology ZSPRAY™... two orthogonal ion sampling zones delivering double the power – unmatched robustness and sensitivity.

Q-Tof™ continues to dominate new analytical challenges. Micromass' paradigm shift in LC-MS now addresses, key emerging pharmaceutical applications (in addition to proteomics)... low levelmetabolite identification, deconvolution of complex combinatorial libraries and patent protection.

As a detailed proof statement of Micromass' work in areas from drug discovery to end product, an application note (No. 233) has been published to evaluate the ZSPRAY™ API ion source for high throughput analysis of drugs directly from cell culture media at high ionic strength. Written in conjunction with members of the Exploratory Drug Delivery Group from Pfizer Central Research the application note assesses the potential of a novel, dual orthogonal sampling, API ion source for the direct analysis of drugs in (un-desalted) cell culture media of the type typically employed in in vitro drug absorption studies. The report states, 'Contrary to our experiences with other mass spectrometer sources, the ZSPRAY™source is entirely suitable for the analysis of samples with high electrolyte concentrations. Indeed, we anticipate that ZSPRAY™ source technology will prove advantageous applied to the analysis of other 'dirty' samples such as protein-precipitated plasma, urine, bile, and extracts from a variety of cell culture experiments'.

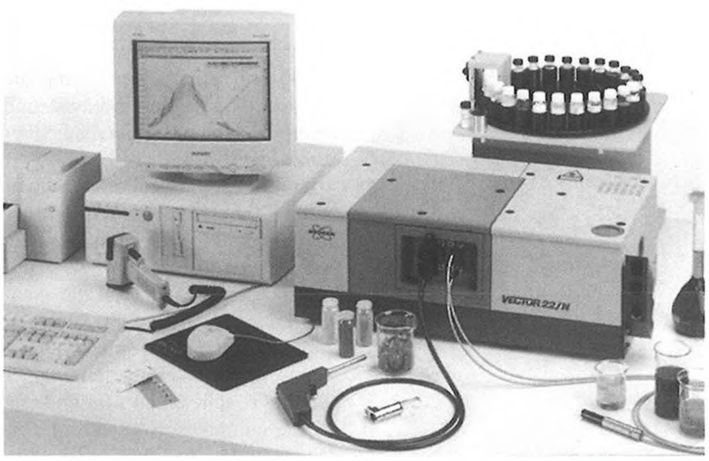
- Micromass
  Itingerstrasse 12
  CH–4450 Sissach
  Telefon 061 973 08 00
  Telefax 061 973 08 04

Leserdienst Nr. 4

Industrielle Anwendungen hochaufgelöster FT-NIR Spektroskopie

Die möglichst frühzeitige Sicherstellung der Produktqualität ist heute in allen Betrieben von zentralem Interesse. Mittels der NIR-Spektroskopie lässt sich die Identität von Stoffen in Sekunden prüfen und die Zusammensetzung von komplexen Gemischen quantifizieren. Die für die Qualitätskontrolle nötigen Messungen können im einfachsten Fall über Lichtleitfasern durchgeführt werden und weitgehend automatisch ablaufen.

Genaue Analysen sind nur auf präzisen Messgeräten möglich. Die Firma BRUKER bietet mit dem VECTOR 22/N und dem IFS 28/N zwei Nahinfrarot-Spektrometer an, mit denen sich auch ausserhalb der geschützten Bedingungen eines Analytiklabors, beispielsweise auf Fahrzeugen in einem Rohstofflager oder in der Umgebung eines Produktionsreaktors, solche Messungen zeitsparend und GLP-gerecht durchführen lassen. Der Messbereich dieser robusten Fourierspektrometer beschränkt sich nicht nur auf einzelne, durch optische Filter definierte Wellenlängen, sondern erstreckt sich von 650 nm bis 2500 nm (15500 cm^{-1}–4000 cm^{-1}). Zur Erleichterung der Methodenentwicklung verfügt die Betriebssoftware UPUS™ über die Möglichkeit der Clusteranalyse. Analysiert man mehrere Chargen von chemisch verwandten Stoffen, so kann nach Angabe der Anzahl der zu erwartenden Klassen eine Clusteranalyse berechnet und in form eines Dendrogramms dargestellt werden.



Für die Identifizierung werden geringe Qualitätsschwankungen der Rohstoffe berücksichtigt, indem in der Referenzbibliothek gemittelte Spektren gespeichert werden. Das Validierungsmodul berechnet zuverlässig, ob es zu Überlappungen zwischen chemisch verwandten Stoffen kommen kann. Ist das der Fall, so muss sich bei der vollautomatischen Identifizierung ein Feinvergleich in einer Unterbibliothek anschliessen. Aufgrund der hohen spektralen Auflösung der Spektrometer von 0.3 nm (2 cm^{-1}), in Verbindung mit einem leistungsfähigen Suchalgorithmus, lassen sich auch sehr ähnliche Stoffe unterscheiden bzw. geringe Verunreinigungen erkennen.

Auch quantitative Analysen (PLS) sind über NIR-Lichtleitfasern durchführbar. Dies ist für die Reaktionsverfolgung im Prozess, aber auch für die Qualitätskontrolle von Endprodukten wichtig.

NIR-Seminar am 6. Oktober in Basel

Weitere Informationen und Veranstaltungsprogramm:

- Bruker AG
  FT-IR/FT-NIR Spektroskopie
  Industriestrasse 26
  CH–8117 Fällanden
  Telefon 01 825 95 48
  Telefax 01 825 95 50

Leserdienst Nr. 5

MATLAB an der Orbit 98

Die Scientific Computers SC bietet im Rahmen der Produktefamilie MATLAB Problemlösungen u.a. in folgenden Bereichen an:

- visuelle Datenanalyse
- Echtzeitanwendungen (Rapid Prototyping)
- Simulation
- Bildverarbeitung
- digitale Signalverarbeitung
- Programmierung
- mathematische Berechnungen
- Finanzanalyse
- Telekommunikation

MATLAB steht für eine vollintegrierte Umgebung, mit der Ideen auf Knopfdruck umgesetzt und auf Echtzeitsystemen ausgetestet werden. Die Software ermöglicht die Betrachtung der Daten in verschiedensten grafischen Formaten. Interessant sind die neuen Toolboxen für Analyse und Visualisierung.

Das Leistungsangebot der SC AG umfasst des weiteren Beratung, Schulung, technischen Support sowie die Realisierung vollständiger Projekte.

- Scientific Computers SC AG
  Schürmattstrasse 6+8
  CH–3073 Gümligen
  Telefon 031 954 20 20
  Telefax 031 954 20 22
  E-Mail info@scientific.ch
  Internet http://www.scientific.de

Leserdienst Nr. 6

Radiometer.
Mehr gibt es über pH-Meter nicht zu sagen.
IG im Internet: http://www.igz.ch

IG Instrumenten-Gesellschaft AG
8045 Zürich, Tel. 01/456 33 33
und in Basel, Bern, Genève
IG
kompetent und servicestark

Neues System für die Oberflächenanalyse in der Qualitätskontrolle

Der neue COULTER® SA3100 charakterisiert poröse Feststoffe durch eine extrem schnelle und genaue Gasadsorptionsanalyse. Durch seine sehr einfache Bedienbarkeit ist das System ideal für den Einsatz in der Qualitätskontrolle geeignet.

Der neue SA3100 arbeitet nach der automatisierten statisch volumetrischen Messmethode nach B.E.T. Für die Messung stehen dem Anwender verschiedene Adsorbatgase wie z.B. Stickstoff, Argon oder Krypton zur Verfügung.

Der SA3100 analysiert Oberflächen mit einer Grösse von 0.01 m^2/g bis über 2000 m^2/g und Porendurchmesser in einem Bereich von 2–200 nm. Der Anwender hat die Wahl zwischen einer Einpunkt- und einer Mehrpunkt-Oberflächenbestimmung.

Durch die Verwendung von maximal 200 Datenpunkten ermöglicht das SA3100 auch die Messung vollständiger Adsorptions-/Desorptionsisotherme. Während der Analyse können gleichzeitig 3 weitere Proben vorbereitet werden.

Durch die Verwendung einer neuen 'Touch-screen'-Technik ist die Bedienung des SA3100 auch für den weniger geübten Anwender sehr einfach. Die Auswertung der spezifischen Oberfläche erfolgt wahlweise nach B.E.T. oder Langmuir. Auch für Mikro-, Meso- und Markoporen stehen spezielle Auswertefunktionen zur Verfügung.

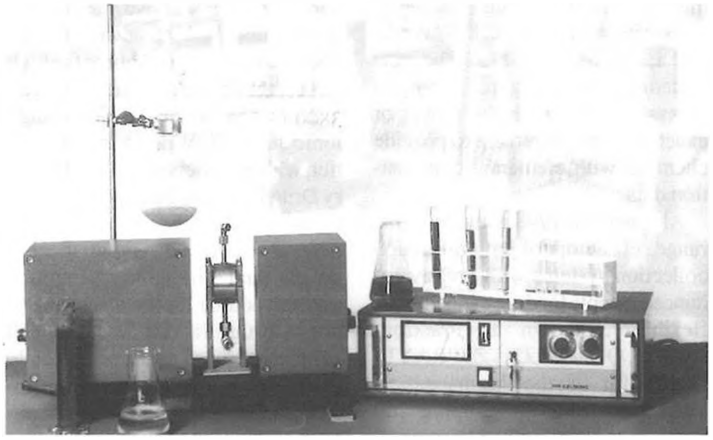
Typische Einsatzgebiete für das neue SA3100 sind Analysen von Katalysatoren, Adsorbenzien, Füllstoffen, Kohle, pharmazeutischen Wirkstoffen, Baustoffen, Mineralien etc.

Das gesamte Lieferprogramm finden Sie auch im Internet unter http://www.igz.ch.

- IG
  Instrumenten-Gesellschaft AG
  Räffelstrasse 32
  CH–8045 Zürich
  Telefon 01 456 33 33
  Telefax 01 456 33 30

Leserdienst Nr. 7

Transmissions-Photometer



Das Gerät ermöglicht das Messen einer bestimmten Komponente in Flüssigkeits- oder Gasgemischen (z.B. Wasser in Methanol, Chlor in Phosgen, etc.). Die Möglichkeit, einzelne Komponenten sowohl flüssiger als auch gasförmiger Stoffe zu messen, zu registrieren oder zu regeln, ist für die Verfahrenstechnik von grossem Wert.

Die Messeinrichtung arbeitet nach einem speziellen Wechsellichtverfahren, das sich durch eine besonders hohe zeitliche Konstanz auszeichnet. Dadurch bewirken die üblichen Störeinflüsse nur einen vernachlässigbar kleinen Einfluss auf die Anzeige.

Durch eine Küvette werden im zeitlichen Wechsel, jedoch im gleichen Strahlengang, ein Mess- und Vergleichs-Lichtstrahl geschickt, die dann auf einem gemeinsamen Lichtempfänger auftreffen. Die verschiedenen Wellenlängen für den Mess- und den Vergleichsstrahl erhält man durch zwei optische Filter. Die Auswahl der Filter erfolgt entsprechend dem Absorptionsverhalten der nachzuweisenden Komponenten. Bei der Messwellenlänge sollen diese eine möglichst starke Absorption und bei der Vergleichswellenlänge eine möglichst schwache Absorption bewirken.

Das Verfahren eignet sich gut für die Analyse eines Stoffgemisches, sofern die einzelnen Komponenten unterschiedliche Absorptionen aufweisen. Es ist erforderlich, die einzelnen Absorptionen genau zu kennen, um die Mess- und Vergleichswellenlänge festzulegen.

Beim Vorhandensein einer Störkomponente kann ein 3-Wellenlängen-Messgerät verwendet werden, um die Störkomponente zu kompensieren.

Falls diese Korrektur nicht ausreicht, da teilweise sehr starke Überlappung der Absorptionsbanden vorliegt, so kann eventuell das neue UV-Prozessspektrometer mit Spektraldaten-Analysensystem verwendet werden.

- Gruba AG
  Eggstrasse 50
  Postfach
  CH–8102 Oberengstringen
  Telefon 01 750 15 26
  Telefax 01 750 15 19

Leserdienst Nr. 8

Relais-Box 731: Power für Ihre Automation

Automatisierte Systeme erfordern das Schalten von Heizungen, Pumpen, Ventilen, Thermostaten oder anderen externen Geräten. Hierfür sind Relais notwendig, die Netzspannung bzw. Niederspannung beliebig ein-/ausschalten können. Der Schaltvorgang sollte dabei von einem Titrino, Titroprocessor, Probenwechsler oder einem anderen Metrohm-Gerät aus erfolgen. Die neue Relais-Box 731 vereinigt all diese Anforderungen, und das in einem nur 10 cm × 19 cm × 23 cm grossen Gehäuse! Die Relais-Box 731 stellt vier Spannungsausgänge zur Verfügung. Zwei 115/230-V-Wechselspannungs-Ausgänge dienen zum Schalten von Netzspannung. Die maximale Leistungsabgabe des eingebauten Netztrafos beträgt dabei 2300 W, so dass das Gerät auch zur Spannungsversorgung von Verbrauchern mit hoher Leistungsaufnahme wie Heizbädern oder Thermostaten geeignet ist.

Zusätzlich verfügt die Relais-Box über zwei Gleichspannungs-Ausgänge, deren Spannung auf Werte von 5, 10, 18 oder 24 V gesetzt werden kann. Der Anwender hat die Möglichkeit, jeden Spannungsausgang mit einer eigenen Signalleitung zu verbinden oder aber eine Signalleitung mit mehreren Ausgängen zu verknüpfen. Durch einfaches Drehen am Wahlschalter wird das Gerät konfiguriert.

- Metrohm AG
  Postfach
  CH–9101 Herisau
  Telefon +41 71 353 85 85
  Telefax +41 71 353 89 01
  http://www.metrohm.ch

Leserdienst Nr. 9

Spektroskopie
Seit über 50 Jahren produziert Jasco hervorragende optische Instrumente:
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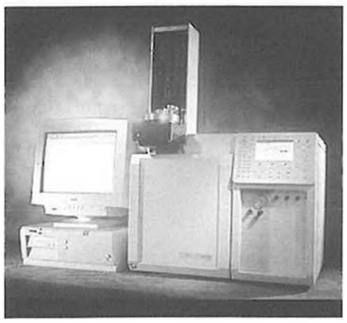
High-Performance GC from Varian Entry Level 3380 GC Aimed at Academic, Government, Basic Chemical Markets



Varian is introducing a high-performance, entry-level gas chromatograph. Designated the 3380 GC, the instrument series is directed to the single injector/single detector market segment as typified by academic, government, and basic chemical laboratories. Based on Varian's highly successful 3800 GC, the 3380 is also compatible with the 8200 AutoSampler and Solid Phase Microextraction (SPME), with the Star Chromatography Workstation, and supports Ethernet communications. The 3380 is produced in four injector/detector configurations: Split Splitless/FID, Packed and 0.53 mm/FID, Split Splitless/ECD, and Packed and 0.53 mm/TCD.

For additional information, or literature contact:

- Varian Analytical Instruments
  Güterstrasse 86
  CH–4002 Basel
  Telefon 061 295 80 00
  Telefax 061 295 80 80
  E-mail
  varian.chrom@ch.varian.com

Leserdienst Nr. 10

Pipettieren/Fraktionieren kleinster Mengen mit Propet

Propet übernimmt für Sie vielfältige Aufgaben im Bereich der Probenvorbereitung und Weiterverarbeitung. Probenmengen ab 0.05 µl können verlustfrei pipettiert werden. Jede Position auf dem Probentisch kann mit höchster Genauigkeit angefahren werden. Auf der Source-Seite können sowohl 96-, 394- wie auch 1536-Well Mikrotiter-Platten verarbeitet werden. Die Mikrotiterplatte kann der Reihe nach abgearbeitet werden, oder nach einem frei definierten Schema. Das gleiche gilt auch für die Destination-Seite, wo anstelle von Mikrotiter-Platten auch frei definierbare Targets eingesetzt werden können. Die Positioniergenauigkeit des Probentisches ist dabei deutlich besser als 50 µm. Um die Probenverschleppung zu eliminieren, können zwischen den Pipettiervorgängen Waschschritte eingebaut werden. Dabei wird die Nadel von innen und aussen gewaschen. Das Gerät kann durch einfaches hinzufügen der Probot-Software zu einem µ-Fraktionensammler umfunktioniert werden. Das ermöglicht das Online-Auftragen auf z.B. Probenträger von MALDI-Massenspektrometern oder/und PVDF-Membranen zur anschliessenden Sequenzierung. Das Steuerprogramm arbeitet unter Windows 95 oder Windows NT 4.0.

- OmniLab AG
  Untere Bahnhofstrasse 14
  CH–8932 Mettmenstetten
  Telefon 01 768 22 11
  Telefax 01 768 23 21
  E-Mail omnilab@omnilab.ch
  Internet http://www.omnilab.ch

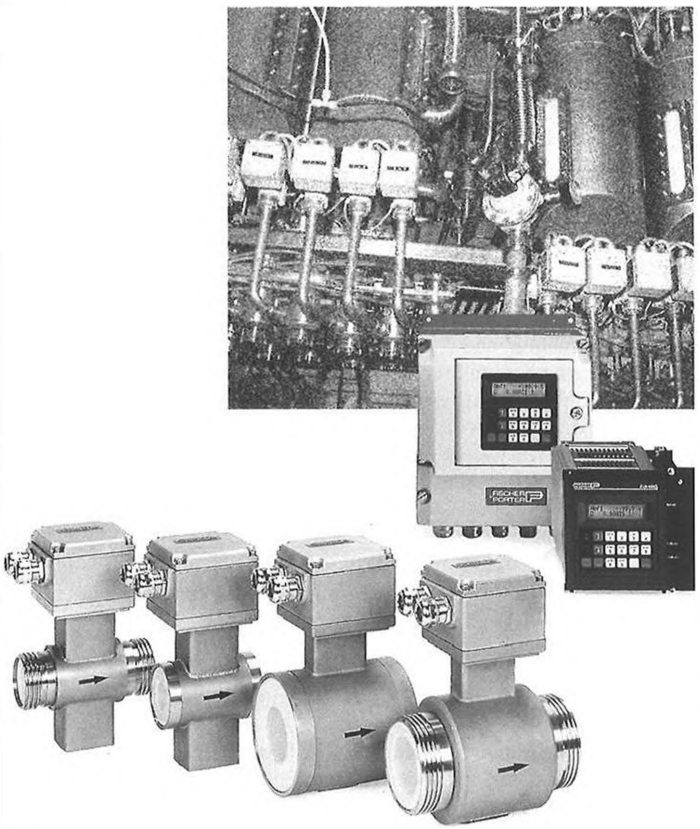
Leserdienst Nr. 11

VA Computrace 757

Der VA Computrace 757 ist ein PC-gesteuertes Voltammetriesystem, in das die bewährte Hardware der Metrohm-VA-Stände integriert ist. Die ausgezeichnete mechanische Stabilität und das hervorragende Signal-Rausch-Verhältnis der Messdaten sind mittlerweile sprichwörtlich.

Der Computrace 757 eignet sich bestens für einfache Routineanalysen. Alle für die quantitative Auswertung notwendigen Parameter sind in wenigen Fenstern übersichtlich zusammengefasst. Beim Einsatz in Forschung und Ausbildung lassen die vielen verfügbaren Strommesstechniken keine Wünsche offen. Messparameter und Voltammogramme werden nebeneinander auf dem Bildschirm dargestellt. So ist die Optimierung einer Messmethode kein Problem mehr. Die unter Windows™ 95 laufende Software

Flüssigkeiten präzis Abfüllen
Induktiver Durchflussmesser Füll-MAG



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umfasst die übersichtliche Benutzeroberfläche mit Druckknopfleiste, von der aus die Steuerung des Gerätes, die Methodenentwicklung sowie die Aufnahme und Auswertung der Voltammogramme erfolgt.

Alle auf dem Bildschirm erscheinenden Kurven, d.h. Voltammogramme, Kalibrier- sowie Standardadditionskurven, aber auch die Ergebnisse können über die Zwischenablage in andere Windows™-Applikationen übertragen werden. Der Datenexport in ASCIII-Format ist ebenfalls möglich.

Der Programmteil 'Determination' dient zur quantitativen Analyse anorganischer oder organischer Substanzen. Die Kalibrierung erfolgt mittels Standardaddition oder Kalibrierkurve und kann manuell oder – unter Verwendung eines Dosimaten 665 – automatisch durchgeführt werden. Der 757 VA Computrace eignet sich hervorragend für die praxisorientierte Voltammetrieausbildung an Universitäten, Fachhochschulen und Betrieben. Der Programmteil 'Exploratory' wurde speziell für diesen Einsatzbereich konzipiert.

Das Instrument bietet die folgenden Messtechniken:

- Sampled DC
  Direct Current (Gleichstrom)
- DP
  Differential Pulse
- SQW
  Square Wave (nach Osteryoung)
- AC
  Alternating Current (Wechselstrom, 1. und 2. Harmonische, phasenselektiv)
- CV
  Cyclic Voltammetry (zyklische Voltammetrie), inklusive Auswertung
- PSA
  Potentiometric Stripping Analysis (Inverschronopotentiometrie)

• Metrohm AG
Postfach
CH–9101 Herisau
Telefon +41 71 353 85 85
Telefax +41 71 353 89 01
http://www.metrohm.ch

Leserdienst Nr. 12

CONTREC Technologies AG übernimmt Gaswarngerätelinie von Imeth AG

CONTREC Technologies AG, Dietikon, hat die Vertretung der Gaswarngerätelinie (Crowcon Ltd., England) für die Schweiz von der Firma Imeth AG, Wetzikon übernommen.

Durch die Vermittlung der englischen Handelskammer in der Schweiz, hat dieser Wechsel in den letzten Monaten stattgefunden. Die Produkte gelten als qualitativ sehr hochwertig und der Hersteller aus Oxford hat seit Jahren eine erfreuliche Wachstumsrate.

Die bereits gut eingeführte Produkte-Linie umfasst fest installierte Gassensoren mit Meldezentralen, mobile Geräte und tragbare Personenschutzgeräte. Gemäss Angaben von CONTREC Technologies AG rechnet man in diesem Bereich mit einer guten Zunahme des Geschäftsvolumens.

Das erhöhte Sicherheitsdenken für Gebäude und Anlagen, der zunehmende Bedarf and Gasen in der industriellen Produktion und auch die neuen Richtlinien der SUVA über den Personenschutz, sprechen für ein Wachstum in diesem Marktsegment.

• CONTREC Technologies AG
Grünaustrasse 23
CH–8953 Dietikon
Telefon 01 743 72 60
Telefax 01 743 72 64
E-Mail contrec@bluewin.ch

Leserdienst Nr. 13

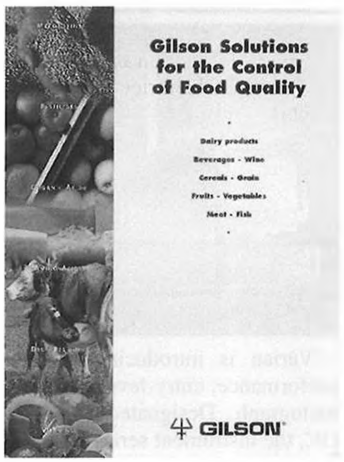
Neu: Broschüre über Qualitätskontrolle in der Lebensmittelindustrie

Eine neue, 20-seitige Broschüre von Gilson befasst sich mit der Qualitätskontrolle in der Lebensmittelindustrie. Das Schwergewicht wird dabei auf die Automation gelegt.

Die Broschüre beinhaltet die Bestimmung von Nährstoffen, Verunreinigungen oder Additiven in Milchprodukten, Zuckern und Stärken, Tierfutter, Getränken und Wein, Früchten und Gemüsen, Zerealien und Getreide, Kleinkinder-Nahrung, Fleisch und Fisch.

Eine informative Kreuztabelle korreliert die Produkte mit den interessierenden Analyten und gibt zusätzliche Informationen über verwendbare Probenvorbereitungs- und Analysensysteme.

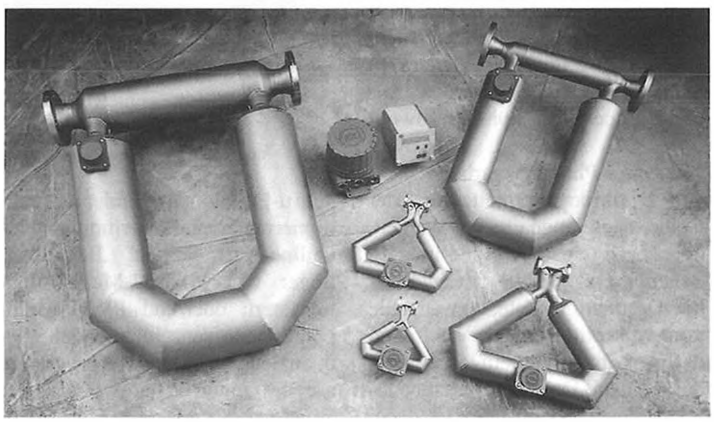
Insgesamt 19 verschiedene Anwendungen werden als Beispiele speziell dargestellt. Darin werden die verwendeten Methoden kurz beschrieben, apparative Aspekte werden erläutert und Resultate geben einen Eindruck der Leistungsfähigkeit der entsprechenden Methode. Für komplette Informationen sind die entsprechenden Literaturhinweise angegeben.



• OmniLab Biosystems AG
Untere Bahnhofstrasse 14
CH–8932 Mettmenstetten
Telefon 01 768 22 11
Telefax 01 768 23 21

Leserdienst Nr. 14

Coriolis-Messtechnik 'gibt Gas'



Bewährte Durchflussmesstechnik jetzt speziell für Gase optimiert

Coriolis-Sensoren messen nicht nur sehr genau den Durchfluss, sondern reduzieren zusätzlich den dafür erforderlichen Aufwand. Es liegt nahe, diese bisher nur für Flüssigkeiten gebräuchliche Messtechnik auch für Gase zu nutzen. Mit der Elite-Baureihe bietet Micro Motion, Wessling bei München, Coriolis-Durchflussmessgeräte an, die speziell auf die physikalischen Eigenschaften von Gasen abgestimmt sind.

Das Fördern von Gasen erfolgt in vielen industriellen Anwendungen mit verhältnismässig geringem Druck bei hoher Fliessgeschwindigkeit. Unter diesen Bedingungen wird die Resonanzfrequenz des Coriolis-Messrohres stark von Störfrequenzen überlagert, d.h. 'verrauscht'. Um trotzdem ein messtechnisch verwertbares Signal zu erhalten, zeichnen sich die Sensoren der Elite-Baureihe durch einen hohen Signal-/Rauschabstand aus.

Eine weitere Besonderheit empfiehlt diese Baureihe für Gasmessungen: die hohe Nullpunktstabilität. Systembedingt weicht der gemessene Nullpunkt etwas vom 'wahren' Nullpunkt ab – er ist geringfügig instabil. Diese Abweichung ist vom Messwert unabhängig. Sie wirkt sich daher am stärksten aus, wenn die Durchflussrate am Rand des Messbereichs liegt. Das ist der Fall, wenn der Anwender den Sensor – wie in der Industrie üblich – 'lieber eine Nummer grösser' wählt. Die hohe Nullpunktstabilität der Elite-Sensoren hält diesen Fehler gering. Um diese Aussagen quantifizieren zu können, hat Micro Moti-

on die Sensoren der Elite-Baureihe über ein breites Spektrum verschiedener Gasdichten und Durchflüsse testen lassen. Die Tests wurden u.a. bei der Colorado Engineering and Experimental Station Inc. (CEESI) auf einem Gaskalibrierstand durchgeführt – mit vielversprechendem Ergebnis. Zum Beispiel beträgt die Messgenauigkeit für das Modell CMF 025 (0–2180 kg/h) für Gasmassedurchfluss ±0,5% des Messwertes. Die Nullpunktabweichung beträgt lediglich 0,0025%, bezogen auf den Endwert.

- Fisher-Rosemount AG
  Blegistrasse 21
  CH–6341 Baar
  Telefon 041 768 61 11
  Telefax 041 768 87 40
  E-Mail fr-ch@frmail.frco.com

Leserdienst Nr. 15

'From DC to Light' – Modernste Technik für alle Frequenzbereiche

Für den Personenschutz in starken elektromagnetischen Feldern ergänzt der Unternehmensbereich 'Safety Test Solutions' von Wander & Goltermann seine Feldanalysatoren und Sonden. Damit wird jetzt eine lückenlose Abdeckung aller Frequenzbereiche und Applikationen von 0 bis 60 GHz, 'From DC to Light' erreicht. Bei starken magnetischen Gleichfeldern, wie sie in der Aluminiumgewinnung, dem Betrieb von Nahverkehrszügen und in der Kernspintomographie auftreten, kommt das neue Tesslameter ETM-1 zum Einsatz. Seit dem März dieses Jahres ist eine neue H-Feld-Sonde auf dem Markt. Sie misst magnetische Felder im Frequenzbereich von 300 kHz bis 30 MHz und wurde speziell für Mittel- und Langwellen im Rundfunkbereich, im Industriesektor für Induktionsschmelzanlagen und hochfrequente Starkstromversorgung entwickelt.

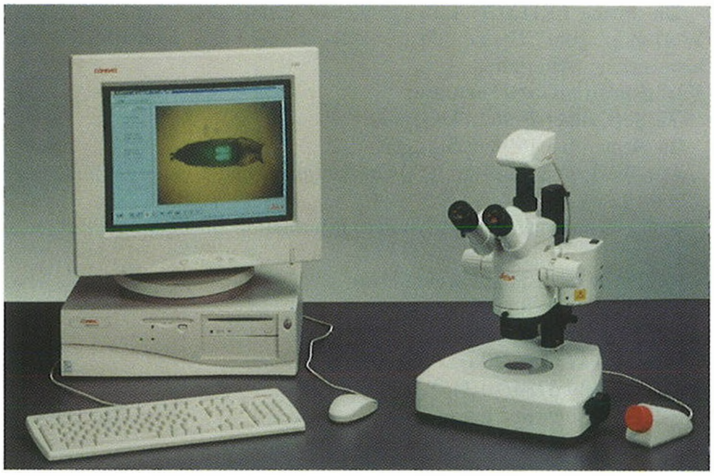
Eine neue E-Feld-Sonde misst elektrische Felder im Bereich bis 60 GHz und rundet damit das Programm nach oben ab. Sie dient der Messung der persönlichen Sicherheit in starken elektromagnetischen Feldern, zum Beispiel während Servicearbeiten an Sende- und Radaranlagen oder in der Satelliten- und Rundfunkkommunikation. Darüber hinaus kommt die Sonde bei der Feldstärkenbestimmung in TEM-Zellen und Absorberräumen zum Einsatz.

Mit den neuen Sondentypen zur Ergänzung der Strahlungsmessgeräte EMR-200/300 und dem neuen Teslameter bietet der Bereich 'Safety Test Solutions' von Wander & Goltermann eine komplette Lösung für Messungen der persönlichen Sicherheit in elektromagnetischen Feldern an.

- Wander & Goltermann
  (Schweiz) AG, Postfach 779
  CH–3018 Bern
  Telefon 031 991 77 81
  Telefax 031 991 47 07

Leserdienst Nr. 16

LEICA DC 100 Digitales Bildaufnahmesystem: Die neue Vision der Mikroskopie



Mit Digital Imaging beginnt ein neues Kapitel in der Geschichte der Fotografie. Und eine Ära mit bestechenden Vorteilen. Digitalisierte Aufnahmen erscheinen im Handumdrehen auf dem Bildschirm, lassen sich bearbeiten, speichern, löschen oder sofort weiterverwenden: Druck, Datenübertragung, Multimediaapplikationen oder Internet Publishing bieten sich an. Mit der neuen LEICA DC 100 hat Leica eine digitale Kamera entwickelt, die sich für praktisch alle Anwendungen in Industrie, Medizin und Forschung eignet und einfach zu bedienen ist. Optik und Software wurden speziell für die Mikroskopie konzipiert und erlauben die rationelle Herstellung, Bearbeitung und Archivierung digitalisierter Bilder in Auflicht- und Durchlichtverfahren sowie Fluoreszenz.

Kamera, Kameraoptik und Software der LEICA DC 100 sind für die Mikroskopie konzipiert. Zusammen mit einem Mikroskop oder Stereomikroskop steht ein leistungsfähiges und preiswertes System zur Verfügung, das mit PC, TWAIN-Treiber und der Leica Bildanalyse-Software QWin kompatibel ist.

Für eine optimale Bildqualität werden die Bildinformationen direkt am CCD Sensor digitalisiert und in Echtzeit auf dem Bildschirm angezeigt. Mit dem 1/2" CCD Sensor erreicht die LEICA DC 100 eine Auflösung von 455K (900K mit Softwareverdoppelung) quadratischen Pixeln. Die Direktübertragung der original Pixelinformationen in den PC, die konstante Informationsverstärkung (Gain) und die Pixelsynchronität zwischen Kamera und Bildschirm ermöglichen Messungen und Analysen von hohem Detailreichtum und grosser Präzision.

Die hohe Farbtreue ist das Resultat des RGB Primärfarbenfilter und der 24 Bit Farbtiefe. Weissabgleich und Helligkeit sind für das ganze Bild (Integral) automatisch geregelt und liefern naturgetreue, flimmerfreie Bilder. Helligkeit und Farbe des Bildes sind zudem manuell regelbar, die Helligkeit auch über eine frei im Bild positionierbare Referenzfläche (Spot).

Dank Bildintegration sind auch bei schwachen Lichtverhältnissen wie etwa bei Fluoreszenz korrekte Aufnahmen möglich und zwar ohne jeden Informations- oder Qualitätsverlust. Die Belichtung erfolgt entweder automatisch oder kann bei extrem heller oder schwacher Beleuchtung interaktiv gesteuert werden.

- Leica Mikroskopie Systeme AG
  Kanalstrasse 21
  CH–8152 Glattbrugg
  Telefon +41 809 33 33
  Telefax +41 810 79 37
  Internet www.leica.com

Leserdienst Nr. 17

Hochleistungs-Ultraschallbäder von Bandelin bieten digitalen Bedienkomfort.

IG Instrumenten-Gesellschaft AG
8045 Zürich, Tel. 01/456 33 33
und in Basel, Bern, Genève

IG kompetent und servicestark

IG im Internet: http://www.igz.ch

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Workshop zum Thema Probenaufbereitung von Kunststoffen und heterogenen Materialien

Die Firma FRITSCH Laborgerätebau veranstaltet einen einntägigen Workshop zum Thema: Probenaufbereitung von Kunststoffen und heterogenen Materialien

Veranstaltungssort/Termine:

22. September 1998 in Düsseldorf

29. September 1998 in Stuttgart.

Der Workshop wird um 9.00 Uhr beginnen und voraussichtlich gegen 17.00 Uhr enden.

Anmeldeunterlagen sowie weitere Information anfordern bei:

- FRITSCH GMBH Laborgerätebau
  Industriestrasse 8
  D–55743 Idar-Oberstein
  Telefon +49 6784/70-0
  Telefax +49 6784/70-11
  E-Mail info@fritsch.de

Leserdienst Nr. 18

Tablettierstempel vollautomatisch Reinigen und Konservieren

Der 3-Stufen Prozess – Ultraschall Reinigung, Intensiv Spülung und anschliessende Konservierung erfolgt vollautomatisch und dauert ca. 15 Minuten.

Die dosierte Ultraschallbehandlung garantiert eine Reinigungsqualität welche mit keiner herkömmlichen Reinigungsmethode zu erreichen ist.

Mechanische Beschädigung ist dabei ausgeschlossen.

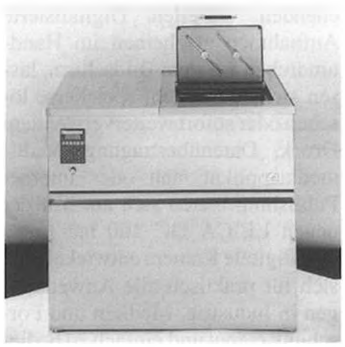
Der Reinigungsautomat ist mit einer integrierten thermischen Desinfektion ausgerüstet. Vorgängig der Inbetriebsetzung erfolgt eine automatische Desinfektion der Reinigungswanne, Rohrleitungen und des Reservoirs.

Der Prozessablauf wird durch einen Mikroprozessor geregelt.

Dieser überwacht und steuert nicht nur Behandlungszeiten, Temperaturen, Dosierung von Reinigungs- und Konservierungsmedien, sondern auch die Anzahl Chargen.

Im System ist ferner eine Fehlermeldeanzeige für alle wesentlichen Parameter integriert. Wahlweise kann auf einem externen Drucker ein Protokoll über den gesamten Reinigungsprozess ausgegeben werden.

Für die Beschickung der Anlage wurde ein intelligentes Handling



System entwickelt: Körbe in Edelstahl mit Einteilungen für alle Stempel- und Matrizengrössen – ausgerüstet mit Traggriffen.

Damit entfällt jegliches Umschichten von Hand. Eine Beschädigungsgefahr der Stempel ist somit auszuschliessen.

Mittels dieses Korbsystems werden Stempel- und Matrizen gereinigt, konserviert und gelagert – von der Maschine – zu der Maschine – ein sicheres und rationelles In-line System.

- Grieshaber
  Cleaning Systems AG
  Althardstrasse 257
  CH–8105 Regensdorf
  Telefon 01 842 30 90
  Telefax 01 842 30 91
  E-Mail gcsag@access.ch

Leserdienst Nr. 19

Umweltfreundlich kühlen und Kosten einsparen!

Vom Rotationsverdampfer bis zum Elektronenmikroskop – für permanente Kühlaufgaben stehen 6 Modelle mit 0,5 bis 6 kW Kühlleistung zur Auswahl: Neue Umlaufkühler, bei denen schon die Befüllung leicht gemacht wird. Die Umwälzpumpe kann bei Entlüftung des Verbrauchers aktiviert werden, um die Bildung von Luftpolstern im System zu vermeiden. Die Förderleistung ist variabel einstellbar, Förderdruck und Füllvolumen werden permanent angezeigt.

Ist- und Sollwert werden über eine LED Temperaturanzeige mit 13 mm hohen Leuchtziffern abgelesen. Über eine Folientastatur können darüber hinaus Grenzwerte eingegeben werden, die Über- und Untertemperatur-Warnfunktionen mit Intervall-Signalton auslösen, um unerwünschte Temperaturveränderungen frühzeitig zu erkennen. Die neuen Umlaufkühler sind weiterhin mit Einfrierschutz, Trockengangschutz sowie Überlastschutz für Pumpenmotor und Kompressor ausgestattet.

Das Belüftungsgitter ist abnehmbar. Unvermeidbarer Staub ist schnell entfernt.

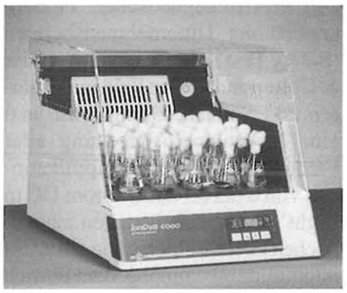
Alle Modelle sind so dimensioniert, dass sie bequem unter dem Labortisch aufgestellt werden können. Die Geräte sind in kurzer Frist amortisiert.

- Merck (Schweiz) AG
  Rüchligstrasse 20
  CH–8953 Dietikon
  Telefon 01 745 11 60
  Telefax 0800 555 514

Leserdienst Nr. 20

Innova Tischinkubationsschüttler von New Brunswick Scientific

Der Innova 4000/4080 bietet die Präzision eines Hochleistungs-Rotationsschüttlers und die einfache Handhabung eines temperaturgeregelten Tischinkubators. Die Kapazität des Modells 4000 wurde gegenüber älteren Modellen um 64% erhöht, ohne die aufstandsfläche des Gerätes wesentlich zu beeinträchtigen. Zuverlässigkeit wird durch eine selbstkorrigierende Mikroprozessorsteuerung erzielt, die Arbeitslast- oder Spannungsabweichungen und thermische Auswirkungen durch exotherme Reaktionen umgehend ausgleicht. Die erhöhte Vielseitigkeit des Innova beruht auf einem erweiterten Drehzahl- (25–500 U/min) und Temperaturbereich (bis 60°, bzw. bis 80°) zum Züchten scherempfindlicher Zellen und Bakterienkulturen.

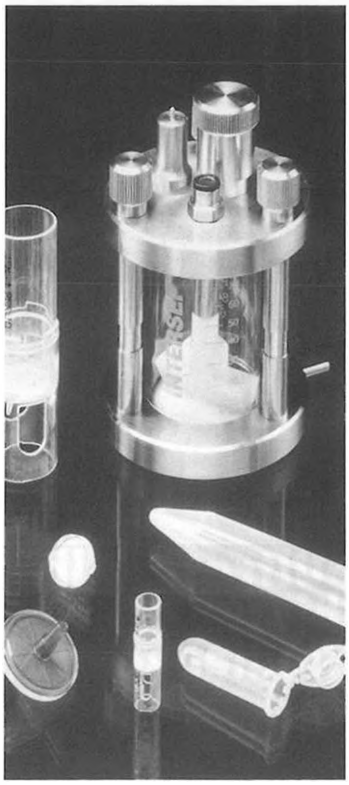


Das gesamte Lieferprogramm finden Sie auch im Internet unter http://www.igz.ch.

- IG
  Instrumenten-Gesellschaft AG
  Räffelstrasse 32
  CH–8045 Zürich
  Telefon 01 456 33 33
  Telefax 01 456 33 30

Leserdienst Nr. 21

HPCL-Probenvorbereitung/Sterilfiltration von Medien



Speziell zur Hochreinigung kleiner Volumina von lösungsmittelhaltigen und wässrigen Proben für die HPCL-Analyse hat Intersep gebrauchsfertige Spritzenvorsätze entwickelt, die unter der Markenbezeichnung 'Syrasep' angeboten werden. Erhältlich sind diese HPCL-Spritzenvorsätze mit den Durchmessern 3 mm, 13 mm und 25 mm steril und unsteril.

Intersept empfiehlt diese Filter-Durchmesser für nachstehende Probenvolumen:

3 mm bei < 1 ml, 13 mm bei 1–5 ml und 25 mm bei 5–100 ml.

Ihre breite chemische Beständigkeit verdanken die Syrasep-Einheiten der Tatsache, dass als Membranen ausschliesslich PTFE sowie Celluloseacetat verwendet werden.

- IG
  Instrumenten-Gesellschaft AG
  Räffelstrasse 32
  CH–8045 Zürich
  Telefon 01 456 33 33
  Telefax 01 456 33 30
  Internet www.igz.ch.

Leserdienst Nr. 22

New Reacto-Station™ Breaks the Temperature Barrier for Combinatorial Chemistry

STEM is delighted to introduce the first Reacto-Station™ capable of allowing parallel synthesis reactions up to 300°.

Now, as well as drug discovery, new applications such as the development of fine chemicals and catalysts can be more fully addressed by the powerful technique of combinatorial chemistry.

Keeping stirrer motors and electronics cool while in close proximity to such high temperatures has previously limited top temperatures to just 150°. Now, thanks to improvements in insulation technology the previous limit has been doubled.

Up to ten reactions can be heated and stirred within a very small footprint thereby minimising limited space on the laboratory bench or inside fume cupboards.

By positioning a special module on top of the station, reactions can also be performed under reflux and near-inert conditions.

- Stem Corporation Limited
  Registered Office:
  Woodrolfe Road
  Tollesbury, CM9 8SJ, U.K.
  Telefon +44(0)1621 868685
  Telefax +44(0)1621 868445
  E-Mail support@stemcorp.com

Leserdienst Nr. 23

NEU: Paralellsynthesesystem rlx 1

Das Werkzeug zur Produktionssteigerung im synthetischen Labor!

Das Chemspeed rlx 1 ist eine neuartige, innovative und kompakte Lösung für die automatische Durchführung von Parallelsynthesen, in welcher der Synthetiker sein gewohntes Methodenregister wie Extrahieren, Eindampfen, Lyophilisieren, Filtrieren etc. noch effizienter einsetzen kann. Es handelt sich um ein mobiles Gerät, das leicht an verschiedensten Orten eingesetzt werden kann und vollautomatisch arbeitet. Eine kurze Auswahl von Möglichkeiten dieses Systems sind:

- Durchführung von bis zu 112 Reaktionen parallel unter den verschiedensten Bedingungen wie Innertgas, Vakuum, Temperaturbereich von –70 bis 160° Reaktionsvolumen von 0.5–100 ml, inklusive Festphasenreaktionen etc.
- Zugabe von Reaktionskomponenten unter Rühren (auch Feststoffe)
- Beschicken von Miktrotiterplatten (z.B. aus dem Reaktionsgemisch)
- Rückflussreaktionen
- Abdampfen von z.B. DMSO oder DMF aus den Reaktionsgefässen bei tiefer Temperatur (50°)
- Online-Analytik der Reaktionen mittels HPLC und/oder Dünnschichtchromatographie
- Online-Aufreinigung mittels präparativer HPLC (z.B. durch ein Gilson System mit Sample-Tracking) oder Festphasenextraktion.
- Mehrstufige Reaktionen welche eine Filtration enthalten (weiterfahren mit Filtrat oder Rückstand/Harz)

Gesteuert wird dieses System inkl. aller Peripheriegeräte (HV-Pumpe, Kryostaten etc.) mit einer intuitiven und flexiblen Software basierend auf Windows.

Mittels Ikonen und Drag and Drop erstellen Sie einfach und schnell komplexe Protokolle. Diese Protokolle können mittels 'Synthesis-Simulation' verifiziert und nötigenfalls korrigiert werden.

- OmniLab Biosystems AG
  Untere Bahnhofstrasse 14
  CH–8932 Mettmenstetten
  Telefon 01 768 22 11
  Telefax 01 768 23 21

Leserdienst Nr. 24

Mikroprozessorgesteuerte Trübungsmessung mit dem Photometer PCcheckit®

Ein neues Gerätekonzept für die Beurteilung von Trübungen in flüssigen Medien bringt die Tintometer GmbH (Schleefstrasse 8a, D–44287 Dortmund, Deutschland) auf den Markt.

Ungelöste, feindisperse Stoffe in Flüssigkeiten (Wasser) rufen eine Trübung hervor. Ein einfallender Lichtstrahl wird durch die vorhandene Trübung in alle Richtungen ungleichmässig gestreut. Standardisiert wird die Streuung des einfallenden Infrarot-Lichtes unter einem Winkel von 90° gemessen. Mit dem Trübungsmessgerät PCcheckit® wird ein Analysesystem vorgestellt, welches durch drei anwählbare Messbereiche die Trübungsbestimmng bis 2.000 TEF/NTU möglich macht.

Spritzwasserschutz, kratzfeste Folientastatur und wasserdichter Messschacht, verbunden mit kompakten Abmessungen und ergonomischer Handhabung zeichnen das Gerät aus. Durch die Verwendung einer langzeitkonstanten LED als Lichtquelle ($\lambda = 875$ nm) und modernster Mikroprozessortechnik wird das Ergebnis mit grösstmöglicher Genauigkeit numerisch angezeigt. Die Eignung zum Prüfmittel ergibt sich durch die softwaregestützte Kalibrier- und Justiermöglichkeit.

- Tintometer AG
  Hauserstrasse 53
  CH–5210 Windisch
  Telefon 056 442 28 29
  Telefax 056 442 41 21

Leserdienst Nr. 25

Leserdienst 'CHIMIA-REPORT'

Die Beiträge der Rubrik «CHIMIA-REPORT» sind mit einer Kennziffer markiert.

Wenn Sie zu einem oder mehreren der auf diese Weise gekennzeichneten Informationsangebote zusätzlich Auskünfte erhalten möchten, empfiehlt sich als einfachster und billigster Weg:

1. Entsprechende Nummer(n) auf dem nebenstehenden Leserdienst-Talon anzeichnen;
2. Absender angeben;
3. Talon an untenstehende Adresse faxen oder einsenden.

Ihre Anfragen werden sofort an die einzelnen Firmen weitergeleitet, die Ihnen die gewünschten Unterlagen gerne zur Verfügung stellen werden. Wir freuen uns, wenn Sie unseren Leserdienst benutzen!

KRETZ AG
CHIMIA-Leserdienst
Postfach, CH–8706 Feldmeilen
Telefon 01 · 923 76 56, Telefax 01 · 923 76 57

CHIMIA-Leserdienst Heft 9/98

Chimia-Report (Talon 3 Monate gültig)
Ich bitte um Unterlagen zu den angekreuzten Kennziffern:

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11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

Name _____

Firma _____

Strasse _____

PLZ/Ort _____

Datum _____ Unterschrift _____

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CHIMIA 52 (1998) Nr. 9 (September)

Jahrbuch 'Chemische Rundschau' 1998

Das Jahrbuch 1998 der 'Chemischen Rundschau' gibt einen Überblick über die wirtschaftliche Entwicklung der Schweizer Grosschemie und das Geschehen auf der internationalen Bühne der Branche des an Mergers und Akquisitionen reichen letzten Jahres. Das bewährte Artikel- und Lieferantenverzeichnis für Entscheidungsträger in Forschung, Labor und Produktion wurde auf den neusten Stand gebracht und repräsentiert das Angebot von 1998.

Das Jahrbuch kann zum Preis von Fr. 25.– plus Porto bezogen werden bei:

- Vogt-Schild/Habegger Medien AG
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  CH–4501 Solothurn
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Der Gilson Dilutor-Dispenser 402 vereint Geschwindigkeit und Reproduzierbarkeit bei allen repetitiven Liquid Handling Aufgaben. Mit einem einzigen Knopfdruck an der Handsonde dosiert die digitale Spritzeneinheit des Instruments Volumina von 1 µl bis 99 ml mit einer exzellenten Präzision. Verdünnungen sind viel schneller gemacht als mit manuellen Pipetten, ein Nachfüllen zwischen den Proben entfällt. Der Gilson Dilutor-Dispenser 402 verarbeitet auch viskose Lösungen, Säuren, Laugen und organische Lösungsmittel. Funktionen wie Verdünnen, Seriell Verdünnen, Dispensieren, Pipettieren, Volumen bestimmen, Titrieren, Mischen, Spülen sind vordefiniert und einfach abrufbar.

Bis zum 30. September 1998 wird der Gilson Dilutor-Dispenser 402 zu Spezialkonditionen angeboten. Informationen erhalten Sie bei:

- OmniLab Biosystems AG
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  Telefon 01 768 22 11
  Telefax 01 768 23 21
  E-Mail omnilab@omnilab.ch
  Internet http://www.omnilab.ch

Leserdienst Nr. 27

Isopad-Heizhauben

Wenn es um die Beheizung von Glaskolben mit Inhalten von 50 ml bis zu 20 l geht, stehen heute im Labor nebst den einfachen Pilz-Heizhauben, die Gehäuseheizhauben im Vordergrund. Die in einem säurefesten, kunststoffbeschichteten Gehäuse eingebauten Heizhauben, sind mit einem Stufenschalter versehen und einfach zu bedienen. Die Typen LG/ER sind zusätzlich mit einem stufenlosen Leistungssteller ausgerüstet.

Zusätzlich zu den Gehäuseheizhauben sind die Sicherheits-Heizhauben Type GSB mit vollisoliertem Heizleiter lieferbar. Zur Überwachung der Temperatur steht eine Regler-Generation zur Verfügung, welche im Design auf die Gehäuseheizhauben abgestimmt wurde. Diese Regler sind mit Schnittstellen für Schreiber-Anschluss versehen.

Für industriellen Einsatz werden spezielle Heizhauben für zylindrische und kugelförmige Glasgefässe bis zu 200 l gefertigt.

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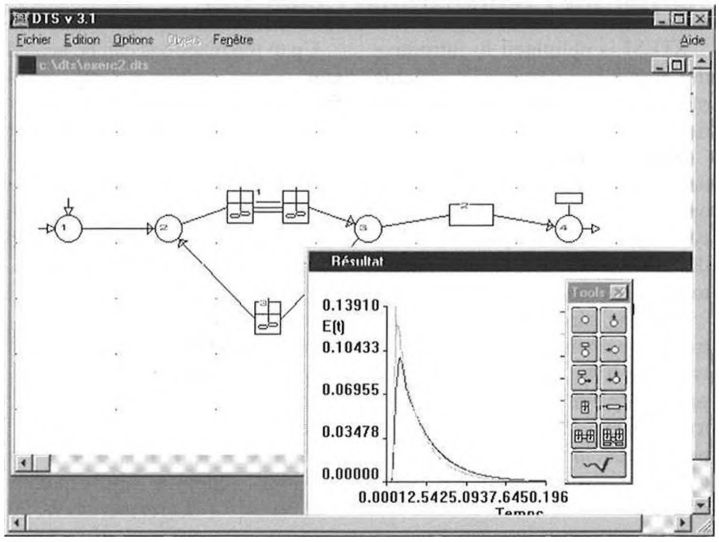

Soll die Leistung eines bestehenden Reaktors verbessert werden, so ist die Kenntnis der Durchmischung notwendig. Im Gegensatz zu aufwendigen Berechnungsmethoden, kann mit Hilfe der Verweilzeittheorie nach Dankwerts die Durchmischung ermittelt werden.

Mit dem Programm DTS, durch Kombination der Units, wie z.B. Rohrreaktor, Rührkesselkaskade, kann die Strömung modelliert werden.

Dieses Programm wurde bis jetzt erfolgreich in verschiedenen Forschungs- und Produktionsprojekten eingesetzt wie z.B. bei der Optimierung einer Raumventilation und eines Membranreaktors.

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- Sysmatec
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  CH–3930 Visp
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Mehr Informationen erhalten Sie bei:

- Kappeler
  Verpackungs-Systeme AG
  Postfach
  CH–3250 Lyss
  Telefon 032 387 07 97
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Leserdienst Nr. 30

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Université de Genève

The **Faculty of Sciences** invites applications for a position of

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Prof. E.P. Kündig, Dépt. de Chimie Organique, Université de Genève, 30, quai Ernest-Ansermet, CH–1211 Genève 4.

Closing date for applications is **Oct. 15, 1998**.
Further information is available: tel. +41 22 702 60 93, fax +41 22 328 73 96, E-Mail: Peter.Kundig@chiorg.unige.ch.
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Bewerbungen mit Lebenslauf und Publikationsliste sind **bis zum 15. November 1998 einzureichen beim Präsidenten der ETH-Zürich, Prof. Dr. *Olaf Kübler*, ETH-Zentrum, CH–8092 Zürich**.

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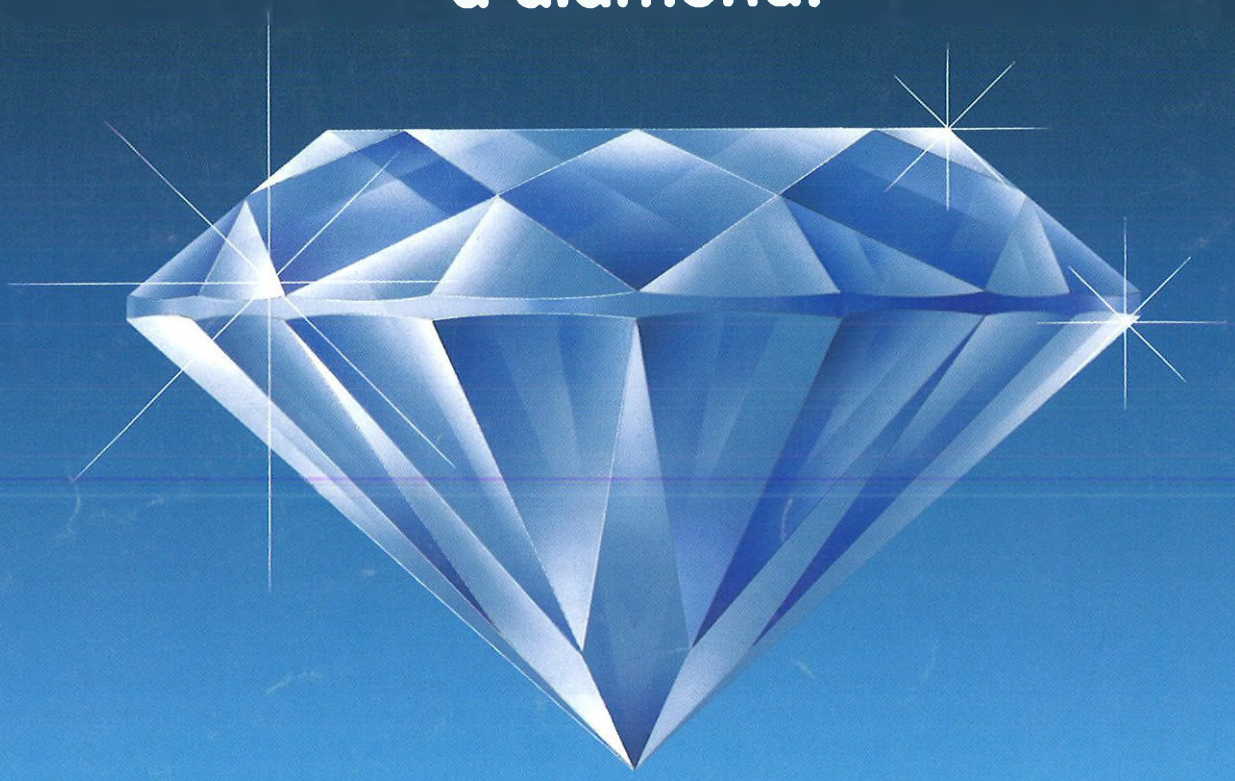

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