doi:10.2533/chimia.2023.161 Chimia 77 (2023) 161–162

Swiss Science Concentrates

A CHIMIA Column

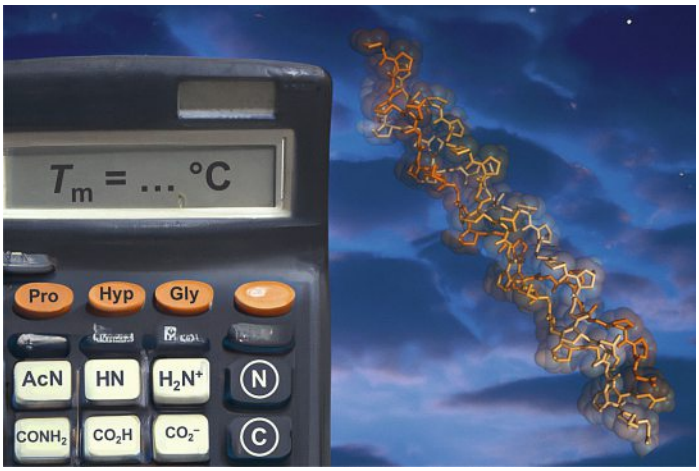
Short Abstracts of Interesting Recent Publications of Swiss Origin

Predicting Collagen Triple Helix Stability through Additive Effects of Terminal Residues and Caps

Tomas Fiala, Emilia P. Barros, Rahel Heeb, Sereina Riniker*, and Helma Wennemers*
Angew. Chem., Int. Ed. **2023**, *62*, e202214728, https://doi.org/10.1002/anie.202214728
ETH Zürich

Functional Collagen Model Peptides (CMPs) have attracted interest in the last decade for diverse applications. For instance, they can be used in regenerative tissue engineering, as biological probes, or as therapeutics.
In an endeavour to understand the influences of terminal residues and caps on CMP triple helix stability, Fiala *et al.* uncovered that small changes in the capping groups or terminal residues can significantly influence the stability of collagen triple helices. The group elucidated that effects like electrostatic interactions, strand preorganization, interstrand H-bonding, and steric repulsion at the termini contribute to triple helix stability in an additive manner. Furthermore, the found additivity of the effects' contributions allowed the group to accurately predict the melting temperatures of new CMP triple helices.

Authors' comments:
"CMPs have been used as model systems of collagen for more than 50 years. Yet, the effect of the CMP frame and terminal functionalities on triple helix stability have not been appreciated. We hope our study will serve the community to rationally design collagen-based materials for years to come."

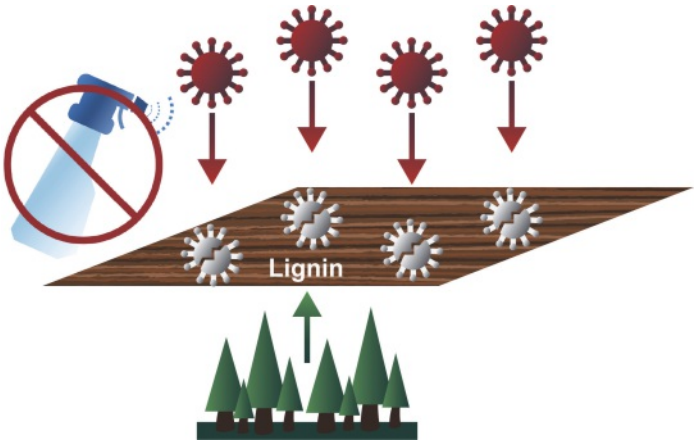


Lignin: A Sustainable Antiviral Coating Material

Alice Boarino, Heyun Wang, Francesca Olgiati, Fiora Artusio, Melis Özkan, Stefania Bertella, Nicolò Razza, Valeria Cagno, Jeremy S. Luterbacher, Harm-Anton Klok,* and Francesco Stellacci*
ACS Sustainable Chem. Eng. **2022**, *10*, 14001, https://doi.org/10.1021/acssuschemeng.2c04284
Institut des Matériaux and Institut des Sciences et Ingénierie Chimiques, Laboratoire des Polymères, École Polytechnique Fédérale de Lausanne (EPFL)

Emergencies such as the one triggered by SARS-CoV and SARS-CoV-2 enhanced the need to have an efficient way to combat transmission of viruses on surfaces. Nowadays, the available coating techniques are based on metal, quaternary ammonium compounds or organic photosensitizers which, despite their efficiency, show problems when it comes to upscaling their production. In this work, a silicon surface was spin-coated with five different lignin-types and tested against herpes simplex virus type 2. Further investigation showed that the viral charge was inactivated by 99% after 30 min, most likely due to the reactive oxygen species (ROS) released by the coating itself once exposed to O_2 and visible light With this work, it has been shown that lignin can be a promising material for antimicrobial/antiviral coating from sustainable sources.

Authors' comments:
"Lignin, a biomass waste, has great potential in the transition towards sustainable resources. Herein we show that this biopolymer can be used to address surface contamination and transmission of viruses."



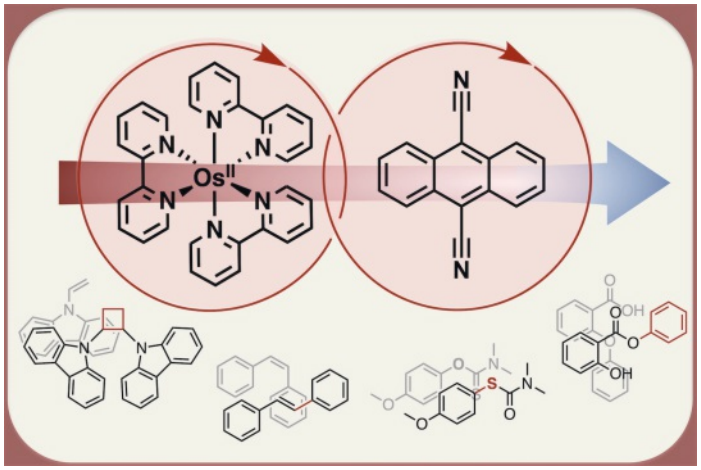
Prepared by Calvin Klein, Lauriane Pillet, Lucia Robustini, Stefania Gianollio, and Francesca Paradisi*
Do you want your article to appear in the SWISS SCIENCE CONCENTRATES highlight?
Please contact francesca.paradisi@unibe.ch

Sensitizer-controlled Photochemical Reactivity *via* Upconversion of Red Light

Felix Glaser and Oliver S. Wenger*
Chem. Sci. **2023**, *14*, 149, https://doi.org/10.1039/D2SC05229F
University of Basel, Department of Chemistry

Multi-photonic excitation strategies have emerged as low-energy alternatives to blue/ultraviolet irradiation to access thermodynamically challenging reactions. While sensitized-triplet-triplet annihilation upconversion (sTTA-UC) is an attractive approach to combine the energy input of multiple photons, the accessible reaction scope so far was mostly limited to reductive substrate activation. Herein, the authors reverted the reactivity of a photocatalytic system composed of a metal-based photosensitizer and 9,10-dicyanoanthracene (DCA) as an organic co-catalyst. Substrate activation switched from a previously reducing ($DCA^{\cdot-}$) to strong oxidizing ($^{1*}DCA$) behaviour, while keeping red light irradiation. In contrast with the challenging reductions enabled by the formation of $DCA^{\cdot-}$ with a copper(I) photosensitizer, $^{1*}DCA$ obtained using an osmium(II) photosensitizer triggered chemical reactions requiring high oxidation potentials.

Authors' comments:
"Upconversion is more frequently studied for lighting and solar energy conversion, but seems underexplored in photoredox catalysis. In this work, the mechanistic analysis laid the foundation for our proof-of-principle applications."



Practical Route for Catalytic Ring-Opening Metathesis Polymerization

Indradip Mandal and Andreas F. M. Kilbinger*
JACSAu **2022**, *2*, 12, 2800, https://doi.org/10.1021/jacsau.2c00566
Department of Chemistry, University of Fribourg, Switzerland

This study describes a new method for synthesizing metathesis polymers using commercially available styrene and its derivatives as efficient regioselective chain transfer agents (CTAs). This method requires up to 1000 times less ruthenium than traditional ring-opening metathesis polymerization (ROMP) experiments, making it more cost-effective and eco-friendly. The molecular weight of the synthesized polymers can be controlled by adjusting the monomer-to-CTA ratio. The study also shows that low molecular weight ROMP polymers with antimicrobial properties can be synthesized on a gram scale using this method. The polymers were characterized using several techniques, including SEC, 1H NMR spectroscopy, and isotopically resolved MALDI-TOF MS. This new method may pave the way for large-scale synthesis of functional metathesis-based materials.

Authors' comments:
"Making short polynorbornene derivatives by ROMP using Grubbs catalysts used to be prohibitively expensive. This limitation has been overcome by our new method."