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Swiss Science Concentrates

A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

Distance–Resilient Conductivity in p-Doped Polythiophenes

Eva Röck, Demetra Tsokkou, Basil Hunger, Maximilian M. Horn, Sepideh Zokaei, Renee Kroon, Jesika Asatryan, Jaime Martin, Christian Müller*, Martijn Kemerink*, and Natalie Banerji*

Mater. Horiz. **2025**
https://doi.org/10.1039/D5MH00620A
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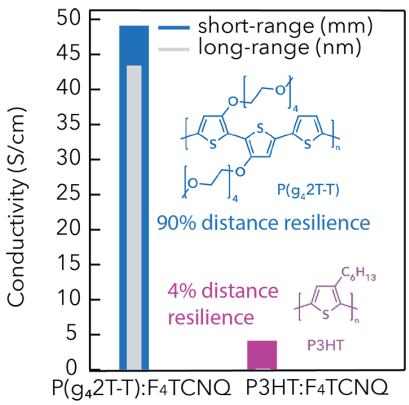
The study investigates charge transport in doped polythiophene films with alkyl and oligoether side chains, focusing on their distance resilience, *i.e.* how stable the conductivity remains across different length scales. When doped with 2,3,5,6-tetrafluoro-tetracyanoquinodimethane (F_4TCNQ), polymers substituted with tri- or tetra-ethylene glycol (P($g_3$2T-T), P($g_4$2T-T)), retain 80–90% of their conductivity from the nanoscale up to the millimeter scale, whereas poly(3-hexylthiophene) (P3HT) loses performance significantly. Doped P($g_3$2T-T) exhibits a hundredfold higher long-range conductivity than P3HT, with peak values up to 330 S/cm. The high conductivity was attributed to a higher dielectric constant, lower energetic disorder, and improved molecular ordering, which facilitate charge transport. Finally, using stronger dopants, the authors demonstrated that systems with conductivities above 30 S/cm exhibit strong distance resilience, independently of the nature of the side chains. Overall, this study presents a strategy to improve doped conjugated polymers by boosting both short- and long-range conductivity for scalable organic electronic devices.

Authors' comments:
"This beautiful collaboration with Chalmers University of Technology and University of Heidelberg unravelled the new concept of distance resilience in doped organic thin films. This highlights the power of nanoscale transport measurements, such as obtained by terahertz spectroscopy."



Enantioselective C-H Amination Catalyzed by Homoleptic Iron Salox Complexes

Wowa Stroek, Nathalie A.V. Rowlinson, Luke A. Hudson, and Martin Albrecht*

Chem. Commun. **2025**, *61*, 15274
https://doi.org/10.1039/D5CC04627K
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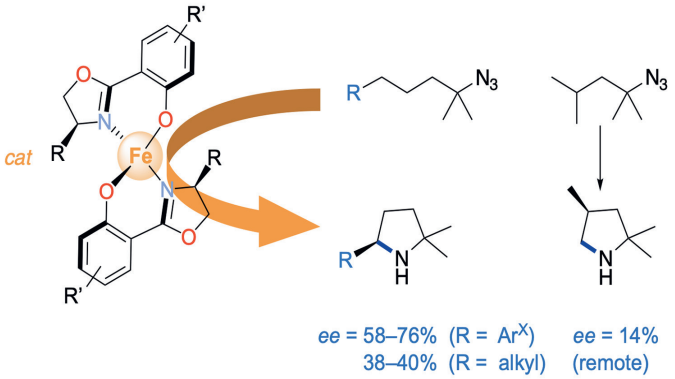
Albrecht and coworkers synthesize a new family of chiral iron (II) complexes using only salicyloxazoline (Salox) ligands and demonstrate for the first time the iron mediated catalysis of intramolecular C–H amination with alkylazides as substrate. By using homoleptic ligands, the authors aimed to reduce the reactivity issues originating from the dynamic nature of the ligands around iron. Thus, the capacity of the catalysts to convert 4-azido-4-methylpentyl)benzene into its pyrrolidine derivative (yield ≥ 90%) in near quantitative yield was demonstrated and Fe((*R*)-2-(4-(*tert*-butyl)-4,5-dihydrooxazol-2-yl)phenolate)$_2$ was identified as the most enantioselective catalyst for this reaction, presenting enantiomeric excesses reaching 76%. In addition, the catalyst allowed the first aliphatic C–H bond amination. Overall, this study set the first stone to C–H activation mediated by an iron catalyst while presenting Salox as a promising ligand to promote the stereocontrol of such reactions.

Authors' comments:
"Great to see that N^O ligands catalyze C–H bond amination, and even greater that they do it asymmetrically. Considering the modularity of the ligand system, even higher enantioselectivities are conceivable!"



Prepared by Cesare Berton, James Southwell, Titouan Chetot, Jonas Genz, Stanislav Prytuliak, Fan Liu, Eda Nisli, Deborah Bäcker, Samy Kichou, Dominik Roth, Laura Schüpke, Jan Vetterli, Henrik Braband, and Jason P. Holland*
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Discovery of Chemical Markers for *Maidong* (Roots of *Ophiopogon Japonicus* and *Liriope Spicata*): A Feature-Based Molecular Networking Approach

Feiyi Lei*, Laurent Bigler, Caroline Weckerle, and Luiz L. Saldanha

J. Pharm. Biomed. Anal. **2026**, 267, 117158
https://doi.org/10.1016/j.jpba.2025.117158
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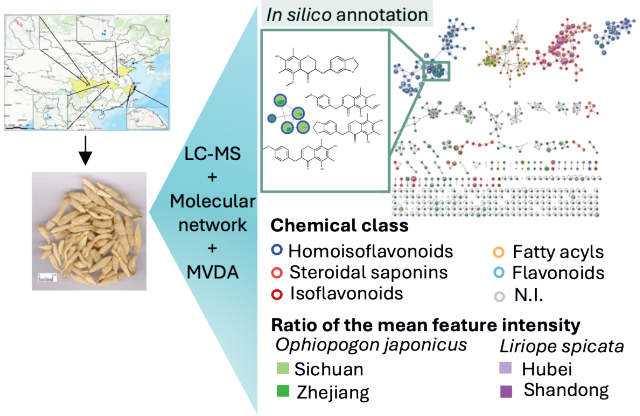
Tuberous roots of *Ophiopogon japonicus* and *Liriope spicata*, collectively known as *Maidong*, are widely used in Chinese medicine for nourishing yin, generating fluids, moistening the lungs, and clearing heart fire. Due to large-scale cultivation, there is a growing need for comprehensive quality assessments, particularly focused on species- and region-specific metabolomic variations. This study applied an untargeted metabolomics approach using ultra-high performance liquid chromatography coupled with a timsTOF Pro mass spectrometer to characterize the chemical composition of Maidong. Feature-based molecular networking and spectral database comparisons enabled the annotation of 58 metabolites, revealing clear inter-species and regional differences. The findings identified steroidal saponins as dominant in *L. spicata* and homoisoflavonoids in *O. japonicus*, highlighting key metabolites that can improve quality control and chemical marker selection for botanical medicines sourced from multiple origins.

Authors' comments:
"Our research employed untargeted metabolomics to identify chemical markers that differentiate multi-origin botanical medicines with the aim of implementing more rigorous quality controls."



Cation Dehydration by Surface-Grafted Phenyl Groups for Enhanced C_{2+} Production in Cu-Catalyzed Electrochemical CO_2 Reduction

Miyeon Chang, Suhwan Yoo, Wenchao Ma, Hubert Girault, Yun J. Hwang, and Xile Hu*

J. Am. Chem. Soc. **2025**, *37*, 34001
https://pubs.acs.org/doi/10.1021/jacs.5c11313
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Hu's team has achieved a significant improvement in electrochemical CO_2 reduction, demonstrating impressive performance in producing C_{2+} species products. By developing a novel approach involving covalently grafted functionalized phenyl groups on Cu surfaces, they achieved a remarkable 7-fold increase in ethylene production (reaching -530 mA cm^{-2}) and a 6-fold increase in C_{2+} products (reaching -760 mA cm^{-2}). Through comprehensive mechanistic studies, including *in situ* infrared spectroscopy and electrochemical analyses, they discovered that surface modification reduces the hydration shell around alkali cations at the electrode-electrolyte interface. This modification enhances water dissociation and increases cation density at the outer Helmholtz plane, creating optimal conditions for C_{2+} production. The findings highlight the critical role of cations in modulating interfacial water structure, offering new insights for advancing CO_2 reduction technology and providing a promising direction for future research in sustainable fuel production.

Authors' comments:
"The research highlights the critical role of optimizing interfacial cations and water structure for high CO_2 reduction performance, aiming to contribute to a deeper understanding of the CO_2 reduction mechanism."