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Swiss Science Concentrates

A CHIMIA Column

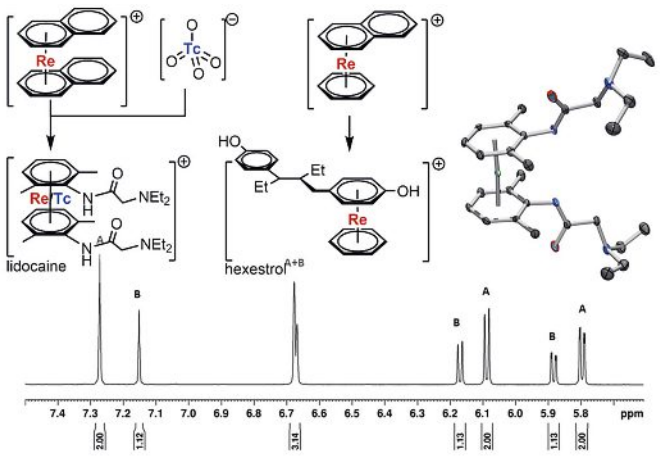
Short Abstracts of Interesting Recent Publications of Swiss Origin

Naphthalene Exchange in $[Re(\eta^6\text{-napht})_2]^+$ with Pharmaceuticals Leads to Highly Functionalized Sandwich Complexes $[M(\eta^6\text{-pharm})_2]^+$ (M=Re/^{99m}Tc)

Qaisar Nadeem Federica Battistin, Olivier Blacque, and Roger Àlberto*. *Chem. Eur. J.* **2022**, *28*, https://doi.org/10.1002/chem.202103566Chem.Eur.
Department of Chemistry University of Zurich, Switzerland

Bioorganometallic complexes of rhenium and other transition metal elements have gained a lot of momentum over the past years. These bis-arene sandwich complexes are generally prepared by the Fischer-Hafner reaction, but these conditions are incompatible with certain functional groups. Herein, the authors report a synthetic pathway, facilitated by NMP, towards sandwich complexes $[Re(\eta^6\text{-arene})_2]^+$ and $[Re(\eta^6\text{-arene})(\eta^6\text{-benzene})]^+$ from $[Re(\eta^6\text{-napht})_2]^+$ and $[Re(\eta^6\text{-napht})(\eta^6\text{-benzene})]^+$, where 'arene' refers to benzene derivatives or active pharmaceuticals such as anesthetics or anticancer drugs. The availability and use of ^{99m}Tc homologues enables molecular theranostics to be performed on these compounds, and work is currently ongoing in biological studies of selected compounds.

Authors' comments:
"Sandwich complexes may form with phenyls of pharmaceuticals. Their topologies and functionalities are left intact, if coordination occurs from appropriate sides; a 'fat' pharmaceutical is obtained. Stereochemical features such as planar chirality emerge."

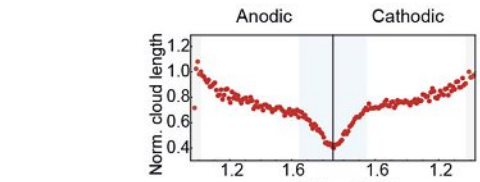


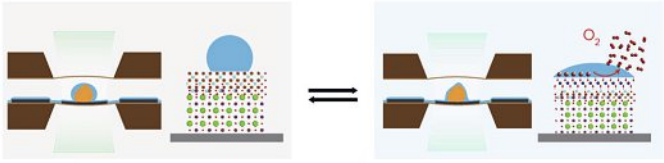
Switchable Wetting of Oxygen-evolving Oxide Catalysts

Tzu-Hsien Shen, Liam Spillane, Jiayu Peng, Yang Shao-Horn, Vasiliki Tileli, *Nat. Catal.* **2022**, *5*, 30–36, https://doi.org/10.1038/s41929-021-00723-w
Institute of Materials, École Polytechnique Fédérale de Lausanne

Electrochemical energy systems are considered as sustainable storage paving the way towards green renewable technologies. Fundamental understanding of these processes involves the interface between the electrode and the electrolyte. In this work, Vasiliki Tileli's group reports a switchable wetting surface property on single particles. Specifically, the potential-regulated hydrophobicity/hydrophilicity at cobalt-based oxide interfaces with an alkaline solution is directly imaged. Employing electrochemical liquid-phase transmission electron microscopy (TEM), Tileli *et al*. probed the switchable wetting behavior at oxygen-evolving catalyst through the dynamic movement of the liquid surrounding the particles. To explain this process, this work proposes an interesting mechanism which shows three distinct regions related to electrowetting, surface reconstruction dynamic, and oxygen evolution along cycling. Overall, these observations provide nanoscale insights into the solid-liquid interactions of catalysts in their native environment through the employment of liquid-phase TEM.

Authors' comments:
"Our characterization framework demonstrated real-time monitoring of solid-liquid interfacial interactions while probing *in operando* the product formation of single oxide particles during oxygen evolution reaction conditions."





Prepared by Gordon Honeyman, Ana I. Benítez-Mateos, Keir Penston, Francisco Javier Santiago Arcos, and Francesca Paradisi*
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Sustainable Cellulose Nanofiber Films from Carrot Pomace as Sprayable Coatings for Food Packaging Applications

Luana Amoroso, Kevin J. De France, Corina I. Milz, Gilberto Siqueira, Tanja Zimmermann, Gustav Nyström, *ACS Sustain. Chem. Eng.* **2022**, *10*, 342–352, https://doi.org/10.1021/acssuschemeng.1c06345.
Empa, ETH Zurich

The authors report a novel source of sustainable food packaging as an attractive alternative to the disproportionate utilization of non-renewable plastics. Carrot pomace from a local Swiss vegetable producer has been selected as a source of cellulose nanofibers (CNF). This food processing residue is very abundant worldwide and is usually discarded. Herein, the carrot pomace was treated in a one-pot bleaching process to homogenize the cellulose material removing the lignin and other residuals from the pomace suspension. The films formed out of bleached CNF presented a high optical transparency, an improved tensile strength, and high toughness. Finally, the CNF were sprayed as a coating on bananas delaying the enzymatic browning. The bleached CNF coating led to a protection of the bananas and increased shelf life by 7 days, representing a significant achievement as a sustainable material for food packaging.

Authors' comments:
"Extraction of high-performance nanocellulose directly from agricultural waste streams and valorising this material in composites, for packaging and beyond, has the potential to close carbon loops and make progress towards materials that are circular by design."

(Image credit: Luana Amoroso)

A New Route to Polyoxometalates via Mechanochemistry

Manuel Wilke* and Nicola Casati, *Chem. Sci.* **2022**, *13*, 1146, https://doi.org/10.1039/d1sc05111c
Paul Scherrer Institute, Villigen PSI

Mechanochemistry has the capacity to offer an alternative path to producing polyoxometalates (POMs) under less stringent conditions than normal. A molybdenum isoPOM and two molybdenum hetroPOMs, of the Strandberg- and Keggin-type, can be generated by grinding together molybdenum oxide, potassium or ammonium carbonate and phosphate. The reaction times vary from 30 minutes to 3 hours. While outcomes are controlled by the stoichiometric ratio of the starting materials and the liquids used. *In situ* investigations of the syntheses reveal the formation of intermediates during the reaction. Identifying these, helps to explain the mechanism by which the intermediates are formed as well as the final POMs.

Authors' comments:
"Mechanochemistry is getting an increasingly relevant tool for the modern chemist, with a large potential still to be uncovered."