



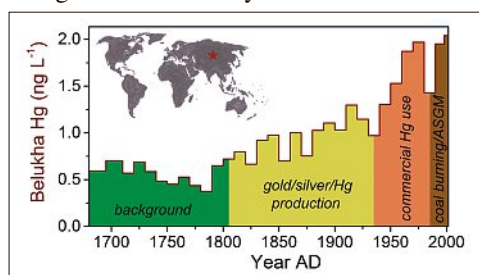
Swiss Science Concentrates

A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

A 320 Year Ice-Core Record of Atmospheric Hg Pollution in the Altai, Central Asia

S. Eyrikh, A. Eichler*, L. Tobler, N. Malygina, T. Papina, and M. Schwikowski, *Environ. Sci. Technol.* **2017**, *51*, 11597. PSI Villigen and University of Bern

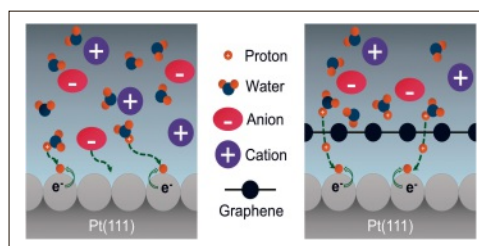


The toxic heavy metal mercury (Hg) is one of the most studied environmental pollutants. However, the consequences of recent Asian emissions on atmospheric Hg levels are still unclear. Eichler and collaborators present a 320-year Hg deposition history for Central Asia. The data are based on a continuous high-resolution ice-core Hg record from the Belukha glacier in the Siberian Altai. Rising Hg emissions from coal combustion and artisanal and small-scale gold mining (ASGM) in Asian countries were found to determine recent atmospheric Hg levels in Central Asia, counteracting emission reductions due to control measures in Europe and North America. The results are discussed with respect to estimates of historical atmospheric Hg emissions and compared with other ice core records.

Single Graphene Layer on Pt(111) Creates Confined Electrochemical Environment via Selective Ion Transport

Y. Fu*, A. V. Rudnev, G. K. H. Wiberg, and M. Arenz*, *Angew. Chem. Int. Ed.* **2017**, *56*, 12883. Universität Bern

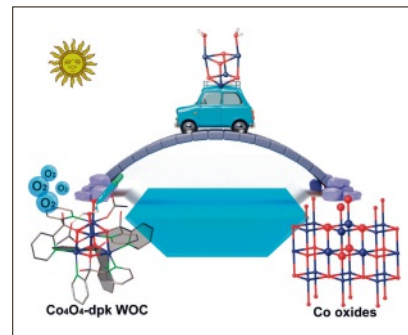
Chemical reactions taking place in a confined space are attracting increasing attention, as the chemical environment in nanoreactors enables the controlling and tuning of trapped atoms or molecules. Fu, Arenz and coworkers studied interfacial electrochemical processes in confined environment by using the two-dimensional space between a graphene layer and a single-crystal Pt(111) surface as a model system. The approach is based on 'fingerprint' voltammetric characteristics of interfacial surface processes on the Pt(111) electrode. They show that protons reversibly pass through the graphene and get reduced, while other more bulky cations, anions and water molecules are completely blocked. Thus, graphene acts as an effective barrier against specific anion adsorption and metal deposition.



{Co₄O₄} and {Co_xNi_{4-x}O₄} Cubane Water Oxidation Catalysts as Surface Cut-Outs of Cobalt Oxides

F. Song, R. Moré, M. Schilling, G. Smolentsev, N. Azzaroli, T. Fox, S. Luber, and G. R. Patzke*, *J. Am. Chem. Soc.* **2017**, *139*, 14198. Universität Zurich

The construction of low-cost and robust water oxidation catalysts (WOCs) is an important step towards clean hydrogen fuel production through photocatalytic water splitting. Cobalt-based WOCs emerged as a model system for fundamental studies and the construction of molecular photoanodes. Patzke and coworkers introduce an active and stable {Co^{II}₄O₄} cubane as the first molecular WOC with the characteristic {H₂O-Co₂(OR)₂-OH₂} edge-site motif representing the required moiety of the most efficient heterogeneous Co-oxide WOCs. In addition, they present the first mixed Co/Ni-cubane WOCs which bridge homogeneous and heterogeneous catalyst design through fine-tuned edge-site environments of the Co centers.



Perovskite Solar Cells with CuSCN Hole Extraction Layers Yield Stabilized Efficiencies Greater than 20%

N. Arora, M. I. Dar*, A. Hinderhofer, N. Pellet, F. Schreiber, S. M. Zakeeruddin, and M. Grätzel*, *Science* **2017**, DOI: 10.1126/science.aam5655. EPF Lausanne

Perovskite solar cells (PSC) with stabilized efficiencies exceeding 20% have been realized only with highly expensive organic hole-transporting materials (HTM). Dar, Grätzel and coworkers present now an alternative with CuSCN as hole extraction layer. The PSCs containing CuSCN as HTM showed high thermal stability, however, their operational stability was poor due to potential induced degradation of the CuSCN/Au contact. After introducing a thin layer of reduced graphene oxide between CuSCN and gold, the resulting PSCs retained >95% of their initial efficiency under operational conditions for 1000 hours under continuous full-sun illumination at 60°C. Intriguingly, not merely under illumination, CuSCN based devices also surpassed the stability of spiro-OMeTAD based PSCs under thermal stress.

