New Application Developments in PGMs – February 2010

Dance of the catalytic nanosphere heterodimers: Platinum
materialsviews.com, 01 February 2010

http://www.materialsviews.com/matview/display/en/1398/TEXT

Image: http://www.materialsviews.com/matview/Images/NEWS_THUMB_1398.jpg

Experimental and theoretical studies of the self-propelled motional dynamics of a new genre of catalytic sphere dimer, which comprises a non-catalytic silica sphere connected to a catalytic platinum sphere, are reported for the first time by researchers from Brazil, Canada and USA.

Carbon dioxide trap and drop: Ruthenium
spectroscopyNOW.com, 01 February 2010

http://www.spectroscopynow.com/coi/cda/detail.cda?id=22952&type=Feature&chId=7&page=1

Alexander Khenkin, Irena Efremenko, Jan Martin, Ronny Neumann, and Lev Weiner of the Weizmann Research Institute in Rehovot, Israel, have studied a polyoxometalate with a Keggin structure substituted with ruthenium(III). The structure $^{6}Q_5[Ru^{III}(H_2O)SiW_{11}O_{39}]$ where ^{6}Q is $(C_6H_{13})_4N^+$ can catalyse the photoreduction of carbon dioxide to carbon monoxide with a tertiary amine, such as triethylamine, as a reducing agent. Progress and mechanistic insights were obtained through UV/Vis and nuclear magnetic resonance, and electron spin resonance spectroscopy as well as computational methods using Gaussian 03.

Direct arylations of indazoles can be performed "on water": Palladium
Noteworthy Chemistry, 01 February 2010

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_023996

M. F. Greaney and coauthors at the University of Edinburgh and the Novartis Horsham Research Center (both in the UK) developed an "on-water" direct arylation technique in which the substrate and catalyst form a heterogeneous mixture in pure water. The reaction is mediated by a palladium–diphenylphosphinoferrocene (dppf) catalyst with an additional PPh_3 ligand and a silver salt under mild conditions.

The on-water reaction is straightforward and allows easy product purification.

Recent applications of palladium-catalyzed coupling reactions in the pharmaceutical, agrochemical, and fine chemical industries
Advanced Synthesis & Catalysis, 2009, Volume 351, Issue 18, Pages 3027-3043

http://dx.doi.org/10.1002/adsc.200900587

Christian Torborg and Matthias Beller of the Leibniz-Institut für Katalyse e.V. an der Universität Rostock review palladium-catalyzed coupling reactions that have been implemented in the last decade into the industrial manufacture of pharmaceuticals and fine chemicals.

A new perspective for understanding the mechanisms of catalytic conversion: Platinum
ESRF | PRESS RELEASE, 09 February 2010

http://www.esrf.eu/news/general/platinum/

The oxidation of toxic carbon monoxide (CO) to carbon dioxide occurs every day in millions of cars. Despite being one of the most studied catalytic processes, the exact mechanism of interaction between the carbon monoxide molecule and the catalyst, often platinum, is not fully understood. An important step in the reaction is the adsorption of CO on the surface of the catalyst. A team of scientists from the ESRF and the ETH in Zurich (Switzerland) has managed to see how the electrons in the platinum reorganize as the adsorption is taking place and why catalysts are "poisoned", i.e. why their activity is reduced. It is the first time that this type of experiment is carried out at the same high temperatures and pressures as in a real car exhaust catalyst.

Sun-powered water splitter makes hydrogen tirelessly: Platinum
tech - New Scientist, 11 February 2010

http://www.newscientist.com/article/dn18511-sunpowered-water-splitter-makes-hydrogen-tirelessly.html

Sunlight + water = hydrogen gas, in a new technique that can convert 60 per cent of sunlight energy absorbed by an electrode into the inflammable fuel.

To generate the gas Thomas Nann and colleagues at the University of East Anglia in Norwich, UK, dip a gold electrode with a special coating into water and expose it to light. clusters of indium phosphide 5 nanometres wide on its surface absorb incoming photons and pass electrons bearing their energy on to clusters of a sulphurous iron compound.

This material combines those electrons with protons from the water to form gaseous hydrogen. A second electrode – plain platinum this time – is needed to complete the circuit electrochemically.

Break-up of stepped platinum catalyst surfaces by high CO coverage
Science, 12 February 2010, Vol. 327, no. 5967, pp. 850-853

http://dx.doi.org/10.1126/science.1182122

Stepped single-crystal surfaces are viewed as models of real catalysts, which consist of small metal particles exposing a large number of low-coordination sites. Researchers from the Lawrence Berkeley National Laboratory and University of California, Berkeley have found that stepped platinum (Pt) surfaces can undergo extensive and reversible restructuring when exposed to carbon monoxide (CO) at pressures above 0.1 torr.

Low-cost electrode produced by Iranian nano-scientists: Palladium
Fars News Agency, 14 February 2010

http://english.farsnews.com/newstext.php?nn=8811250237

Iranian nano-researchers achieved synthesis of an electrode requiring a minimum use of palladium, utilized in fuel cells and sensors. The researchers at the University of Isfahan managed to prepare an electrode from gold with acceptable oxygen reduction electro-catalytic ability and coated its surface with least possible amount of palladium.

Unexpected partners: Palladium catalysts containing unique molecular ligands couple aromatic rings together in surprising ways
Research Highlights - RIKEN RESEARCH, 26 February 2010

http://www.rikenresearch.riken.jp/eng/research/6187

Image: A new molecular ligand, called DHTP, helps selectively generate ortho-coupled aromatic rings (left) instead of the usual coupled product (link below).

http://www.rikenresearch.riken.jp/images/figures/low_4236.jpg

Shunpei Ishikawa and Kei Manabe from the RIKEN Advanced Science Institute in Wako and the University of Shizuoka, Japan, have developed a palladium-catalyzed procedure that couples aromatic rings in completely unexpected ways, thanks to a new molecular ligand with specially designed spatial attributes.

For more scientific research papers on platinum group metals go to: www.platinummetalsreview.com