New Application Developments in PGMs – October 2009

"Cancer-fighting bone implants": Platinum
Highlights in Chemical Science, 01 October 2009

http://www.rsc.org/Publishing/ChemScience/Volume/2009/11/Cancer_implants.asp

Norberto Roveri, at the University of Bologna, Italy, and colleagues combined a synthetic bone substitute called hydroxyapatite (HA) with anticancer platinum complexes to produce implantable devices that can control the drugs' release and improve their cytotoxicity. The team hope that by releasing drugs only at target areas, they will be able to avoid the side effects common with anticancer medication.

New findings lead to increase in nanoclusters' melting point: Platinum
INIC | News, 06 October

http://en.nano.ir/page/page.php?lang=en&path=/news&i1step=detail&i1id=1392

A molecular-dynamics study of thermal and physical properties of platinum nanoclusters has been carried out by Iranian scientists:

http://dx.doi.org/10.1016/j.fluid.2009.02.018

Make unfunctionalized aldehydes highly reactive in hydroacylation reactions: Rhodium
Noteworthy Chemistry, 12 October 2009

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_023187

Y. Shibata and K. Tanaka at Tokyo University of Agriculture and Technology (Japan) report a successful strategy that combines unfunctionalized aldehydes and 1,1-disubstituted alkenes via a rhodium-catalyzed intermolecular method. A key to their success is the selection of a monoaromatic bisphosphine ligand QuinoxP (1) that leads to γ-ketoamide products (e.g., 2). The reaction features high yields and enantiomeric excesses and low catalyst loadings.

Particle size and shape affect ruthenium/γ-alumina catalyst activity
Noteworthy Chemistry, 12 October 2009

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/CNBP_023187

D. G. Vlachos and coauthors at the University of Delaware (Newark) and Yeshiva University (New York City) prepared ruthenium nanoparticles with particle sizes ranging from 0.8 to 7.5 nm with γ-Al2O3 as the catalyst support, and they studied the catalyst's behavior in the NH3 decomposition reaction.

Growing geodesic carbon nanodomes: Iridium
EurekAlert!, 12 October 2009

Tiny carbon islands bubble up at the center to form nanoscopic geodesic domes

http://www.eurekalert.org/pub_releases/2009-10/aps-ggc100909.php

Paolo Lacovig, Monica Pozzo, Dario Alfè, Paolo Vilmercati, Alessandro Baraldi, and Silvano Lizzit at institutions in Italy, the UK and USA, analyzing the assembly of graphene (sheets of carbon only one atom thick) on a surface of iridium have found that the sheets grow by first forming tiny carbon domes. The discovery offers new insight into the growth of graphene layers and points the way to possible methods for assembling components of graphene-based computer circuits.

Tiny steps to electrode surfaces double efficiency of fuel cells: Platinum
AZoNano, 14 October 2009

http://www.azonano.com/news.asp?newsID=14156

Researchers at MIT, the Japan Institute of Science and Technology and Brookhaven National Laboratory, have found a method that promises to dramatically increase the efficiency of the electrodes in one type of fuel cell, which uses methanol as its fuel.

The key to the boost in efficiency, the team found, is to change the surface texture of the material. By creating tiny stair-steps to the surface instead of leaving it smooth, the electrode's ability to catalyze oxidation of the fuel and thus produce electric current was approximately doubled in experiments, and the researchers believe that further development of these surface structures could end up producing far greater increases, yielding more electric current for a given amount of platinum.

Metals could forge new cancer drug: Osmium, Ruthenium
EurekAlert!, 18 October 2009

http://www.eurekalert.org/pub_releases/2009-10/uow-mcf101609.php

Drugs made using unusual metals could form an effective treatment against colon and ovarian cancer, including cancerous cells that have developed immunity to other drugs, according to research at the University of Warwick and the University of Leeds.

The study, published in the Journal of Medicinal Chemistry, showed that a range of compounds containing the two transition metals ruthenium and osmium, which are found in the same part of the periodic table as precious metals like platinum and gold, cause significant cell death in ovarian and colon cancer cells.

Amide linkage isomerism as an activity switch for organometallic osmium and ruthenium anticancer complexes

Sabine H. van Rijt, Andrew J. Hebden, Thakshila Amaresekera, Robert J. Deeth, Guy J. Clarkson, Simon Parsons, Patrick C. McGowan and Peter J. Sadler, J. Med. Chem., September 30, 2009

http://dx.doi.org/10.1021/jm900731j

Researchers make key step towards turning methane gas into liquid fuel: Rhodium
EurekAlert!, 22 October 2009

http://www.eurekalert.org/pub_releases/2009-10/uow-rmk101809.php

Researchers at the University of Washington and the University of North Carolina at Chapel Hill have taken an important step in converting methane gas to a liquid, potentially making it more useful as a fuel and as a source for making other chemicals.

Binding methane to a metal catalyst is the first step required to selectively break just one of the carbon-hydrogen bonds in the process of converting the gas to methanol or another liquid. The researchers describe the first observation of a metal complex that binds methane in solution. In the complex, the methane's carbon-hydrogen bonds remained intact as they are bound to rhodium.

Characterization of a rhodium(I) σ-methane complex in solution

Science, 23 October 2009, Vol. 326, no. 5952, pp. 553-556

http://dx.doi.org/10.1126/science.1177485

A ruthenium(II) polypyridyl complex for direct imaging of DNA structure in living cells
Nature Chemistry, 23 October 2009, 1, (8), 662-667

http://dx.doi.org/10.1038/nchem.406

University of Sheffield researchers present a dinuclear ruthenium(II) polypyridyl system that works as a multifunctional biological imaging agent staining the DNA of eukaryotic and prokaryotic cells for both luminescence and transition electron microscopy.

Plasmons shine a light on catalysis: Platinum
physicsworld.com, 27 October 2009

http://physicsworld.com/cws/article/news/40780

Image: Catalyst and sensing structure used to monitor changes in adsorbate coverage,

http://images.iop.org/objects/physicsweb/news/13/10/31/new1.jpg

Nanoplasmonic probes of catalytic reactions
Science, October 22, 2009

http://dx.doi.org/10.1126/science.1176593

Bengt Kasemo and colleagues at Chalmers University have developed a plasmonic sensing method for such reactions based on arrays of nanofabricated gold disks, covered by a thin (~10 nm) coating (catalyst support) on which the catalyst is deposited. The sensing particles monitor changes in surface coverage of reactants (below 0.1 monolayers) during catalytic reaction through peak shifts in the optical extinction spectrum. Sensitivities to below 10^{-3} monolayers are estimated. The capacity of the method is demonstrated for three catalytic reactions, CO and H_2 oxidation on Pt and NOx conversion to N_2 on Pt/BaO.

Carbon nanotube-DNA nanotechnology for improved fuel cell catalysts: Platinum
Nanowerk, 28 October 2009

http://www.nanowerk.com/spotlight/spotid=13248.php

Lifeng Dong, an assistant professor in the Department of Physics, Astronomy, and Materials Science at Missouri State University, describes the use of single-stranded DNA molecules to disperse single-walled carbon nanotubes in aqueous solution and as templates for the binding of platinum ions to form platinum nanoparticles along the nanotubes.

Gold nanoparticles delivery platinum warheads to tumors
Nanowerk, October 29, 2009

http://www.nanowerk.com/news/newsid=13274.php

A team of investigators led by Stephen Lippard, of the Massachusetts Institute of Technology, and Chad Mirkin, of Northwestern University and principal investigator of the Northwestern Center for Cancer Nanotechnology Excellence, describes its development and characterization of gold nanoparticles as a delivery vehicle for a non-toxic form of platinum known as platinum(IV). The gold nanoparticles are coated with short pieces of nucleic acid to which the investigators chemically attach platinum(IV).

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