New Application Developments in PGMs – February 2009

Here's a better way to make α-aminoindan intermediates: Ruthenium
Patent Watch, 2 February 2009

http://portal.acs.org/portal/PublicWebSite/patent/archive/WPCP_011804

α-Aminoindan derivatives such as compound 1 are intermediates used to synthesize drugs for treating bipolar disorder. An existing method used to prepare these intermediates includes Friedel–Crafts and Baeyer–Villiger reactions that have low yields and safety problems. B. Bertrand and co-inventors disclose a new process that begins with the acylation of oxime 2 to form 3 in 77% yield. The next step is heterogeneous catalytic hydrogenation of 3 using an Ir/C catalyst to form the enamide 4 in 84% yield.

Fluorescent tags to see catalysts in action: Palladium
Chemical Science, 03 February 2009

http://www.rsc.org/Publishing/ChemScience/Volume/2009/03/Fluorescent_tags_catalysts.asp

German researchers have used a fluorescent tag to monitor the state of a catalyst during a chemical reaction.

Herbert Plenio and colleagues from the Darmstadt University of Technology tagged an N-heterocyclic carbene ligand in a palladium catalyst with a fluorescent dye. They followed the catalyst's progress in a Suzuki cross-coupling reaction using fluorescence spectroscopy. The team found that the fluorescence signal changed at each stage of the reaction. When the catalyst was activated by a base, the signal decreased within a few seconds. It then remained stable until the substrate was added, then decreased gradually until the end of the reaction. The tag also allowed Plenio to see any catalyst impurities left in the product.

Michael Spencelayh

Make methane while the sun shines: Platinum
Nature News, 05 February

http://www.nature.com/news/2009/090205/full/news.2009.83.html

Researchers have used sunlight to convert carbon dioxide and water vapour into a range of fuels faster than ever before, thanks to a nanotube catalyst.

Materials scientist Craig Grimes and his colleagues at Pennsylvania State University in University Park have used hollow titania (titanium dioxide) nanotubes around 135 nanometres wide and a tenth of a millimetre long to catalyse the reaction.

Charles Choi

Iranian researchers Reduce Automotive Emissions by Nanocatalysts: Palladium
Iranian Nanotechnology Initiative, 07 February 2009

http://www.nano.ir/en/news.php?News_Id=1220

Researchers at the University of Tehran synthesized a new generation of tri-purposed nano-catalysts, which are an important development in reducing automotive exhaust gas emissions.

“Conventional exhaust catalysts are loaded with excess amounts of precious metals such as platinum, palladium and rhodium for treatment of pollutants," said Sina Sartipi, who carried out the research.

Catalytic nanotubes better expensive metal rivals: Platinum
Tce today, 09 February 2009

http://www.tcetoday.com/tcetoday/NewsDetail.aspx?nid=11446

MATERIAL ENGINEERS REPORT that fuel cells using nitrogen-doped carbon nanotubes outperform those with platinum catalysts.

Researchers around the world are working hard to wean transportation off its fossil fuel dependence. Fuel cells are the oft-hailed solution to this addiction but a number of hurdles need jumping before cars can commercially kick their petrol habits. For starters, fuel cells require a catalyst at the cathode to efficiently combine oxygen with electrons and protons, or the reaction runs too slowly. Unfortunately, the catalyst preferred conventionally consists of platinum, which is both extremely expensive, being bought at $/g prices, and very rare – it is present in the Earth’s crust at 0.003 ppb.

Adam Duckett

Implantable system-on-a-chip (SoC) improves drugtherapy: Platinum
EE Times, 13 February 2009

http://www.eetasia.com/ART_8800562982_499495_NP_84e8ecf3.HTM

Engineers at National Taiwan University have developed an implantable SoC capable of drug delivery within a living person that has shown potential for improving the effectiveness of drug therapy through precision control, according to a paper presented on Feb. 10 at the IEEE's International Solid State Circuits Conference (ISSCC).

The implantable CMOS SoC features monolithic integration of a wireless controller/actuation circuitry and a drug delivery array, according to the paper. The authors describe the device as the first of its kind.

By releasing drugs such as nonapeptide leuprolide acetate or nitroglycerin, the SoC could be used for applications such as the localized diagnosis and therapy of cancers or providing immediate treatment for heart attack victims, researchers said. The system can be implanted through minimally invasive surgery, and the wireless capability and doctors to make non-invasive therapy modification, they said.

Dylan McGrath

Take a mechanochemical approach to the Suzuki-Miyaura reaction: Palladium
ACS, 16 February 2009

http://portal.acs.org/portal/PublicWebSite/noteworthy/archive/WPCP_011974

The Suzuki–Miyaura reaction is one of the most studied C–C coupling reactions for industrial applications. The procedure involves a halide, a boronic acid, an inorganic base, and a palladium source; it requires a solvent and sometimes elevated temperature. B. Ondruschka and coauthors at Friedrich-Schiller University Jena and the Technical University of Braunschweig (both in Germany) report a mechanochemical approach to this reaction that uses ball milling.

The authors chose the reaction between 4-bromoacetophenone and phenylboronic acid in the presence of $KF–Al_2O_3$ and $Pd(OAc)_2$ as their model. They selected grinding materials (type, size, and number of milling balls), beaker material, revolutions per minute (rpm), and milling time as the parameters to be optimized.

Jose C Barros

Single nanocatalyst behaviour revealed: Gold, Platinum
Chemistry World | News, 18 February 2009

http://www.rsc.org/chemistryworld/News/2009/February/18020902.asp

The team led by Peng Chen at Cornell University, Ithaca, have devised a technique for studying the catalytic properties of individual gold nanoparticles - which gets around the traditional problem with studying nanocatalysts, says Chen. 'No matter how good a synthetic chemist you are, the nanoparticles you make will have slightly different sizes and shapes, and this is why you need to study one particle at a time, so you don't have to average all of them.'

Using single molecule fluorescence, Chen could 'watch' single nanoparticles react with single reactants, and quantify the heterogeneity between different particles. 'We knew nanoparticle behaviours were different among at population, but just how different they are has been challenging to quantify before now,' says Chen.

Nina Notman

Gold-palladium Nanoparticles Achieve Greener, Smarter Production Of Hydrogen Peroxide: Palladium
ScienceDaily, 19 February 2009

http://www.sciencedaily.com/releases/2009/02/090219141507.htm

Hydrogen peroxide is one of the world's most versatile and widely used chemicals. A powerful oxidizing agent, H_2O_2 is commonly used as a bleach, an antiseptic and a disinfectant.

Despite its importance, however, says Christopher J. Kiely, hydrogen peroxide has eluded the best efforts of the chemists seeking a more direct, efficient and environmentally friendly means of producing it.

"Hydrogen peroxide has for decades been made by an indirect energy-intensive process," says Kiely, a professor of materials science and engineering at Lehigh University.

Anon

A low-temperature route for the preparation ofnano-sized CaRuO3: Ruthenium
Nanotechweb.org | Lab talk, 20 February 2009

http://nanotechweb.org/cws/article/lab/37891

An increasingly important area of application for CaRuO3 is its use as a substrate for epitaxial growth in multilayer electronic devices. Also, as it has no magnetic order, it can also be used as an effective electrode material for ferroelectric devices and for use in a Josephson junction as a metallic barrier.

In this study, which was published in Nanotechnology, the authors used reverse micelle synthesis to produce nano-sized CaRuO3. It was found that by sintering the amorphous precursor at 500 °C that crystalline nanoparticles of CaRuO3 formed, whereas, sintering at higher temperatures resulted in the formation of rod-like crystals of the perovskite structure.

Chemistry professor awarded prestigious SloanFellowship: Gold, Platinum
Nevada news| University of Nevada, 23 February 2009

http://www.unr.edu/nevadanews/templates/details.aspx?articleid=4856&zoneid=14

The last few years have been a time of great accomplishment for Liming Zhang, a fast-rising assistant professor in the Chemistry Department in the University of Nevada, Reno's College of Science.

Less than a year after Zhang learned that he had received a $500,000 National Science Foundation (NSF) CAREER Award – a defining milestone in the career of young scientists throughout the country – the 37-year-old Zhang was informed on Feb. 17 that he has been named an Alfred P. Sloan Research Fellow.

The two-year Sloan Fellowship, which is $50,000 and is awarded by the Alfred P. Sloan Foundation of New York, is designed to support the work of exceptional young researchers early in their academic careers and often at pivotal stages in their work.

John Trent

A palladium–curcumin complex may help fight prostate cancer: Palladium
ACS, 23 February 2009

An elusive aromatic hybrid organic–inorganic benzene has been isolated. Borazine (1), benzene's isoelectronic inorganic counterpart, exhibits the remarkable feature of aromaticity. Although borazine was reported in 1926, the corresponding hybrid structure 1,2-dihydro-1,2-azaborine (2) has eluded synthesis and characterization. D. A. Dixon, S.-Y. Liu, and coauthors at the University of Alabama (Tuscaloosa) and the University of Oregon (Eugene) report an innovative synthesis of 2. Their accomplishment demonstrates that 2 is not only isolable but has remarkable stability that is consistent with substantial aromatic character.

Ben Zhong Tang
