



Johnson Matthey

# Platinum Metals Review

January 2010

<http://www.platinummetalsreview.com/>

**This issue contains the following:**

## ***Asymmetric Reduction of Ketones and Aldehydes in Water***

Asymmetric transfer hydrogenation, or ATH, has for some years been an extremely useful method for achieving the reduction of prochiral compounds with a hydrogen source other than hydrogen gas. This feature makes it a practical tool for widespread application in industry, as does its high reaction rate and broad substrate scope. A significant breakthrough in this field was the recent discovery that the pgm complex-catalysed ATH of ketones and aldehydes can be performed in water, without detriment to reaction rate or selectivity. By removing the need for an organic solvent, many reactions can now be undertaken more easily and cost-effectively – and with far less impact on the environment. A comprehensive overview of this work is given by researchers from the Liverpool Centre for Materials and Catalysis at The University of Liverpool in the UK. The group is led by Professor Jianliang Xiao, who in 2008 received the UK Prize for Process Chemistry Research in recognition of the value of this and related work to large-scale chemical manufacturing.



Above: Professor Jianliang Xiao (left) receiving the GlaxoSmithKline, AstraZeneca and Pfizer Prize for Process Chemistry Research for 2008

## ***Platinum Group Mineral Formation in Sulfide Ores***

The most significant geological occurrence of pgms is in a type of layered igneous rock deposited in the earth's crust by magmatic upwellings from the mantle below. David Holwell (University of Leicester, UK) and Iain McDonald (Cardiff University, UK) review recent studies to collate a model for the behaviour of the platinum group elements in these natural sulfide systems. A number of key factors are found to influence the formation of platinum group minerals and their association with the base metal sulfides.

## ***Palladium Hallmarking in the UK***

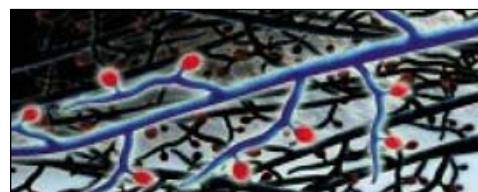


Above: Part of the new palladium hallmark (shown here for 950 palladium), which depicts the head of the Greek goddess Pallas Athena

Robert Organ, Deputy Warden of the Goldsmiths' Company at the Assay Office in London, discusses the recent introduction of a hallmark for palladium. Palladium's growing popularity as a jewellery metal led to the hallmark being voluntarily applied to more than 27,000 items in the two months following its introduction, before being made compulsory in January 2010.

## ***Recovery of Palladium Catalyst from Solution***

The removal of palladium catalyst from the final product solution of cross-coupling reactions is the subject of this issue's Final Analysis. Specialists from Johnson Matthey in the UK and Finland discuss the use of Smopex<sup>®</sup> fibres to scavenge palladium and other pgms down to very low levels. The viability of this method is demonstrated by two industrial case studies.



Above: A Smopex<sup>®</sup> fibre, with functional groups shown in red

## Conference Reviews:

Palladium-catalysed cross-coupling and ruthenium-catalysed metathesis reactions remain two of the most powerful and versatile classes of reaction in organic chemical synthesis. The latest advances in these areas are summarised in a review of the *15th IUPAC Symposium on Organometallic Chemistry Directed Towards Organic Synthesis* by Chris Barnard of JMTC Sonning Common, UK.

Increasingly strict legislation and the demand for smaller, cheaper diesel passenger vehicles continue to raise the bar for diesel emissions control. The annual *Society of Automotive Engineers (SAE) World Congress* provides a forum for discussion of the global research efforts that are aimed at ensuring the technology keeps pace. Tim Johnson of Corning Environmental Technologies considers how improved understanding has led to efficiency improvements – both in the established technologies, such as diesel oxidation catalysts, and in the newer strategies for combating nitrogen oxides.

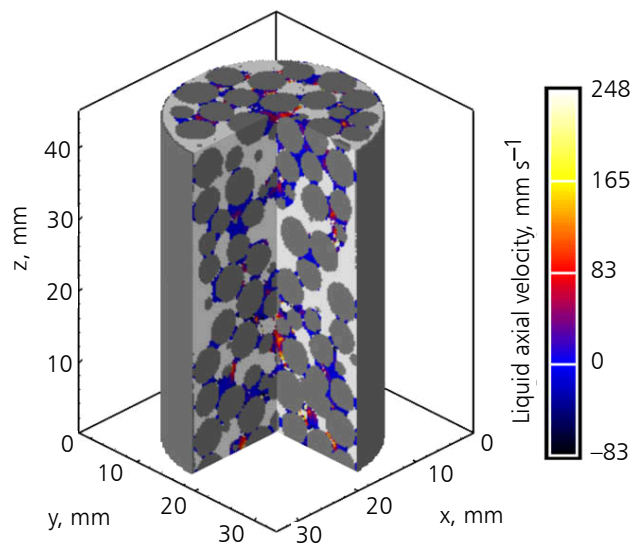


Above: The Honda FCX Clarity hydrogen fuel cell vehicle. Image courtesy of Honda Motor Company

The annual *Johnson Matthey Academic Conference* aims to facilitate the exchange of information and ideas between Johnson Matthey's technical teams and the students and academics being supported by the company. This review of the conference, by Debra Jones and James Cookson of JMTC Sonning Common, provides an illustration of how academics and industrialists can work together to solve real-world technical problems.

Right: A three-dimensional map of liquid flow in a reactor, generated using magnetic resonance imaging, shows the variation in flow velocity through the catalyst bed (Image reprinted with permission from Elsevier)

A review of the *Eleventh Grove Fuel Cell Symposium* by UK consultant Don Cameron amply demonstrates that fuel cells have matured: the focus has moved from fundamental electrocatalyst science to commercial exploitation of the technology. As pilot studies continue to test and refine their application, new markets for fuel cells are opening up all the time.



## Book Review:

Data storage was revolutionised by the invention of perpendicular magnetic recording, a medium which allows for much denser storage of digital information. It is based on a complex layered structure of platinum alloys and a soft underlayer containing ruthenium. This technology, among others, is covered in the book *“High Density Data Storage: Principle, Technology, and Materials”*, edited by Yanlin Song and Daoben Zhu from the Chinese Academy of Sciences, and reviewed for *Platinum Metals Review* by Dan Carter, a Senior Analyst in the Johnson Matthey Market Research team.

## Contact:

To see the full articles or for more information:

Website: <http://www.platinummetalsreview.com/>

E-mail: [jmpmr@matthey.com](mailto:jmpmr@matthey.com)

Tel: +44 (0)1763 256325

Fax: +44 (0)1763 256359

Platinum Metals Review is published by Johnson Matthey PLC  
Orchard Road, Royston, Hertfordshire  
SG8 5HE, UK