

# ABSTRACTS

of current literature on the platinum metals and their alloys

## PROPERTIES

### Free-Standing Nanofibrous Platinum Sheets and Their Conductivity

X. PENG, Y.-H. LUO, J. JIN, J. HUANG, I. ICHINOSE, K. KURASHIMA and F. PAPANIMITRAKOPOULOS, *Chem. Commun.*, 2006, (45), 4688–4690

Nanofibrous Pt sheets (1) with a thickness of one to a few tens of nm were prepared over the sub- $\mu\text{m}$  pores of a polycarbonate membrane filter by using long and rigid  $\text{Cd}(\text{OH})_2$  nanostrands as templates. The sheet resistance of (1) at 10 nm reached 5797  $\Omega$  per square. The conductivity of (1) decreased with the thickness by more than two orders of magnitude.

### $\text{SiO}_2$ Nanotubes with Nanodispersed Pt in the Walls

C. H. RÜSCHER, I. BANNAT, A. FELDHOFF, L. REN and M. WARK, *Microporous Mesoporous Mater.*, 2007, 99, (1–2), 30–36

$\text{SiO}_2$  nanotubes (NTs) of different wall thickness were prepared using fibres of  $[\text{Pt}(\text{NH}_3)_4](\text{HCO}_3)_2$  salt crystals (1) as templates. During growth of the  $\text{SiO}_2$  NT walls, by sol-gel condensation from tetraethyl orthosilicate on the surface of (1), parts of (1) were incorporated into the walls. Calcination in air at 450°C led to the formation of Pt nanoparticles and micropores within the  $\text{SiO}_2$  NT walls.

### Influence of Thermal Annealing on the Resistivity of Titanium/Platinum Thin Films

U. SCHMID and H. SEIDEL, *J. Vac. Sci. Technol. A*, 2006, 24, (6), 2139–2146

The effect of thermal annealing at  $\leq 700^\circ\text{C}$  on the room-temperature resistivity of electron-beam-evaporated Ti/Pt thin films (on oxidised Si wafers) was studied. The Ti adhesion layer had a fixed thickness of 5 nm. The thickness of the Pt top was 21–97 nm. At annealing temperatures  $\leq 450^\circ\text{C}$ , the film resistivity of the bilayer system showed a linear correlation with the reciprocal Pt film thickness. At  $\geq 600^\circ\text{C}$ , the diffusion of Ti into the top layer led to an enhanced increase in film resistivity, especially at low Pt thicknesses.

### Isothermal Section of the Fe–Pt–Nd Phase Diagram at 900°C

X. CHENGFU, G. ZHENGFEI, C. GANG, M. LEI and Z. BO, *J. Alloys Compd.*, 2006, 424, (1–2), 128–130

Equilibrium phase diagrams for the ternary system Fe–Pt–Nd (1) at 900°C ( $\text{Nd} \leq 70\%$ ) were established. 13 single-phase regions were determined. 23 two-phase regions and 11 three-phase regions were identified to exist at this isothermal section. The  $\text{Nd}_3\text{Pt}_4$  phase decomposes gradually into the two neighbouring compounds  $\beta\text{NdPt}$  and  $\text{NdPt}_2$  with introduction of Fe. For Fe contents  $> 5$  at.%, the existence of  $\text{Nd}_3\text{Pt}_4$  phase was not observed in (1).

### Martensitic Transformation in FePd Alloy Revealed by Synchrotron Radiation

M. MITSUKA, T. OHBA, T. FUKUDA, T. KAKESHITA and M. TANAKA, *Mater. Sci. Eng.: A*, 2006, 438–440, 332–335

Synchrotron radiation experiments were carried out in a precursor study of the martensitic transformation in  $\text{Fe}_{68.6}\text{Pd}_{31.2}$ . Six wavelengths, which give various penetration depths, were used for observing the transformation behaviour. Oscillation photographs with various wavelengths were taken at temperatures above the martensitic transformation temperature.

### Oxidation of Ruthenium Aluminide-Based Alloys: The Role of Microstructure and Platinum Additions

F. CAO, T. K. NANDY, D. STOBBE and T. M. POLLOCK, *Intermetallics*, 2007, 15, (1), 34–43

The cyclic oxidation behaviour of six RuAl-based alloys (1) was studied in air over 1000–1300°C. Single-phase (1) formed a layered oxide structure during oxidation. The presence of the  $\delta$ -Ru-rich eutectic along grain boundaries strongly accelerated the oxidation process. A single-phase Pt-containing (1) exhibited the highest oxidation resistance; this is derived from its rejection to the Ru-rich layer subsequently formed during oxidation.

## CHEMICAL COMPOUNDS

### Pyrazole-Based Allylpalladium Complexes: Supramolecular Architecture and Liquid Crystal Behaviour

M. C. TORRALBA, M. CANO, J. A. CAMPO, J. V. HERAS, E. PINILLA and M. R. TORRES, *Inorg. Chem. Commun.*, 2006, 9, (12), 1271–1275

The coordination of non-mesomorphic 3-substituted pyrazoles  $\text{Hpz}^R$  to the  $[\text{Pd}(\eta^3\text{-C}_3\text{H}_5)]^+$  fragment gave  $[\text{Pd}(\eta^3\text{-C}_3\text{H}_5)(\text{Hpz}^R)_2]^+$  (1) ( $R = \text{C}_6\text{H}_4\text{OC}_n\text{H}_{2n+1}$ ;  $n = 12, 14, 16, 18$ ), which were isolated with  $\text{BF}_4^-$ . (1) have liquid crystal properties, exhibiting monotropic or enantiotropic smectic A mesophases between  $\sim 40$ – $80^\circ\text{C}$ . (1) with  $n = 12$  has an interdigitated layer-like supramolecular arrangement.

### Dinitrogen Complexes of Pincer-Ligated Iridium

R. GHOSH, M. KANZELBERGER, T. J. EMGE, G. S. HALL and A. S. GOLDMAN, *Organometallics*, 2006, 25, (23), 5668–5671

Precursors of the (PCP)Ir fragment ( $\text{PCP} = \kappa^3\text{-C}_6\text{H}_3\text{-2,6-(CH}_2\text{P}^t\text{Bu}_2)_2$ ), including (PCP)IrPhH and (PCP)Ir(NBE), reacted with dinitrogen to give  $[(\text{PCP})\text{Ir}]_2(\text{N}_2)$  (1). With excess dinitrogen, mononuclear (PCP)Ir( $\text{N}_2$ ) (2) was formed predominantly ( $\sim 99\%$  under typical conditions at 1 atm of  $\text{N}_2$ ), in equilibrium with small concentrations of (1). (1) selectively crystallised out at ambient temperature. (1) and (2) are pseudo-square planar.

## ELECTROCHEMISTRY

### Kinetics of Electron-Transfer Reactions at Nanoelectrodes

P. SUN and M. V. MIRKIN, *Anal. Chem.*, 2006, 78, (18), 6526–6534

Disk-type, polished Pt nanoelectrodes were characterised using voltammetry, SEM and scanning electrochemical microscopy. A number of experimental curves were obtained at the same nanoelectrode to attain accuracy and reproducibility similar to those reported previously for  $\mu\text{m}$ -sized probes. A new analytical approximation was developed and used for analysis of steady-state tip voltammograms.

## PHOTOCONVERSION

### Photooxidation of Olefins under Oxygen in Platinum(II) Complex-Loaded Mesoporous Molecular Sieves

K. FENG, R.-Y. ZHANG, L.-Z. WU, B. TU, M.-L. PENG, L.-P. ZHANG, D. ZHAO and C.-H. TUNG, *J. Am. Chem. Soc.*, 2006, 128, (45), 14685–14690

A cyclometallated Pt(II) complex (1) was incorporated into (3-aminopropyl) triethoxysilane-modified channels of ordered mesoporous silica SBA-15. Studies on the  $^1\text{O}_2$  generation demonstrated that the olefins in the nanochannels of SBA-15 could be enriched 8 times higher than those in a homogeneous solution. The loaded (1) is stable. The photosensitised oxidation occurs efficiently. Simple filtration can be used to recover and then recycle the Pt catalyst.

### Effect of Substituents on the Photoluminescent and Electroluminescent Properties of Substituted Cyclometallated Iridium(III) Complexes

H.-W. HONG and T.-M. CHEN, *Mater. Chem. Phys.*, 2007, 101, (1), 170–176

Cyclometallated iridium complex dopants (1) using substituted (4- $\text{CF}_3$ , 4-Me, 4-OMe, 4-F, 3-F) 2-phenylbenzoxazole ligands have been synthesised. (1) are thermally stable (280–320°C), depending upon the substituents, and sublimable. (1) emit bright yellow to green light. The peak emission wavelengths of (1) can be tuned depending upon the electronic properties of the substituents as well as their positions in the ring.

### Visible Light Decomposition of Ammonia to $\text{N}_2$ with $\text{Ru}(\text{bpy})_3^{2+}$ Sensitizer

J. NEMOTO, C. HARADA, Y. TAKEI, N. KATAKURA and M. KANEKO, *Photochem. Photobiol. Sci.*, 2007, 6, (1), 77–82

Visible light decomposition of aqueous  $\text{NH}_3$  to  $\text{N}_2$  was investigated using either  $\text{Ru}(\text{bpy})_3^{2+}/\text{K}_2\text{S}_2\text{O}_8$  (1) or  $\text{Ru}(\text{bpy})_3^{2+}$ /methylviologen dichloride ( $\text{MV}^{2+}$ )/ $\text{O}_2$  (2) sensitizer systems. In the case of (1), GC analysis of the gaseous phase in the presence of 8.1 M  $\text{NH}_3$  showed that the photochemical oxidation of  $\text{NH}_3$  yielded  $\text{N}_2$ . For (2), in an  $\text{O}_2$  atmosphere, the oxidation of  $\text{MV}^{2+}$  to  $\text{MV}^{2+}$  takes place to accumulate a Ru(III) complex, so that an oxidised product of ammonia ( $(\text{NH}_3)\text{ox}$ ) was then further oxidised to  $\text{N}_2$ .

### Ru Dye Uptake under Pressurized $\text{CO}_2$ Improvement of Photovoltaic Performances for Dye-Sensitized Solar Cells

Y. OGOMI, S. SAKAGUCHI, T. KADO, M. KONO, Y. YAMAGUCHI and S. HAYASE, *J. Electrochem. Soc.*, 2006, 153, (12), A2294–A2297

Black dye  $[(\text{C}_6\text{H}_5)_4\text{N}]_3[\text{Ru}(\text{Htcterpy})(\text{NCS})_3]$  (tcterpy = 4,4',4''-tricarboxy-2,2':6',2''-terpyridine) and  $\text{N}_3$  dye [*cis*-di(thiocyanato)-*N,N'*-bis(2,2'-bipyridyl)-4,4'-dicarboxylato] ruthenium(II)] (1) are adsorbed on nanoporous  $\text{TiO}_2$  layers, under a pressurized  $\text{CO}_2$  atmosphere, to bond the Ru dyes on inner surfaces of  $\text{TiO}_2$  in nanoporous layers. The time needed for adsorption of (1) is shortened to 30 min; from 300 min required for a dipping process. The amount of (1) adsorbed increased from 15 to 20  $\text{nmol cm}^{-2} \mu\text{m}^{-1}$ .

## ELECTRODEPOSITION AND SURFACE COATINGS

### Electrochemical Characterization of Platinum Black Electrodeposited from Electrolyte Including Lead Acetate Trihydrate

M. SAITOU, *Surf. Coat. Technol.*, 2006, 201, (6), 3611–3614

The effect of Pb acetate trihydrate (1) on Pt black coating for a  $\text{H}_2\text{PtCl}_6$  electrolyte has been investigated. (1) enhances the electrode reactions in Pt black coating. This is by mainly lowering the energy barrier for the reduction of Pt(IV) to Pt(0) and by suppressing the reduction of Pt(IV) to Pt(II).

### Deposition of Ni and Pd Sulfide Thin Films via Aerosol-Assisted CVD

P. O'BRIEN and J. WATERS, *Chem. Vap. Deposition*, 2006, 12, (10), 620–626

Thin films (1) of Ni sulfide ( $\text{NiS}_{1.03}$ ,  $\text{NiS}_2$ ,  $\alpha\text{-Ni}_7\text{S}_6$ , or mixtures thereof) and Pd sulfide ( $\text{PdS}$ ,  $\text{Pd}_{16}\text{S}_7$ ,  $\text{Pd}_4\text{S}$ , or mixtures thereof) were prepared by aerosol-assisted (AA)CVD. Dithiocarbamate precursors  $\text{M}(\text{S}_2\text{CNRR}')_2$  ( $\text{M} = \text{Ni}, \text{Pd}$ ;  $\text{RR}' = \text{Et}_2, \text{MeEt}, \text{Me}^n\text{Bu}$ , or  $\text{Me}^n\text{Hex}$ ) were used. (1) were grown on glass substrates at 400–525°C. XRD, EDAX, and SEM were used to characterise (1).

## APPARATUS AND TECHNIQUE

### Catalytic (Pt-Y) Membranes for the Purification of $\text{H}_2$ -Rich Streams

P. BERNARDO, C. ALGIERI, G. BARBIERI and E. DRIOLI, *Catal. Today*, 2006, 118, (1–2), 90–97

Pt-loaded catalytic membranes (1), prepared from FAU (Na-Y) zeolite membranes by ion-exchange, were used for the purification of  $\text{H}_2$ -rich streams by means of CO selective oxidation. (1) present the zeolite layer on the inner surface of  $\alpha\text{-Al}_2\text{O}_3$  tubular supports. A CO conversion of 98% and a selectivity of 62% were obtained on feeding (1) a  $\text{H}_2$ -rich mixture containing  $\sim 10\%$  CO at 200°C (with  $\lambda = 1.66$ ). CO removal to  $< 50$  ppm was achieved at 200°C and 2 bar starting from 1% CO (with  $\lambda = 3.6$ ).

## HETEROGENEOUS CATALYSIS

### Catalytic Performance of Pt-Sn/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> for Diesel Soot Oxidation

G. CORRO, J. L. G. FIERRO and F. BAÑUELOS ROMERO, *Catal. Commun.*, 2006, 7, (11), 867–874

Presulfating  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, 1% Pt/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> and 1% Pt-2% Sn/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> resulted in the generation of surface sites active at low temperature in the oxidation of a fraction of soot particles produced during diesel combustion. Addition of Sn to 1% Pt/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> caused an increase of Pt resistance to deactivation. Surface Sn species may prevent polymerised hydrocarbon residues reaching the interface between Pt and the support.

### Effect of Hydrothermal Treatment on Catalytic Properties of PtSnNa/ZSM-5 Catalyst for Propane Dehydrogenation

Y. ZHANG, Y. ZHOU, K. YANG, Y. LI, Y. WANG, Y. XU and P. WU, *Microporous Mesoporous Mater.*, 2006, 96, (1–3), 245–254

The dehydrogenation of propane in the presence of H<sub>2</sub> using PtSnNa/ZSM-5 (1) was studied. Under mild hydrothermal treatment, the pore volume and the average pore diameter of (1) increased. However, the opposite occurred with an increase of hydrothermal temperature and time. The intensity of Lewis acid sites on (1) decreased slightly from 400°C to 550°C, and an important loss of acidity took place at 650°C. (1) hydrotreated at 650°C exhibited Sn species loss and Pt sintering, which caused an activity decrease and selectivity modifications during the reaction.

### Selective Hydrogenation of Ethyne in Ethene-Rich Streams on Palladium Catalysts. Part 1. Effect of Changes to the Catalyst During Reaction

A. BORODZINSKI and G. C. BOND, *Catal. Rev.*, 2006, 48, (2), 91–144

The effect of various changes to the Pd catalyst during its stabilisation in the selective hydrogenation of ethyne-ethene mixtures (formation of  $\beta$ -PdH and PdC<sub>x</sub> phases and of carbonaceous deposits) was reviewed. A carbonaceous overlayer on the Pd surface creates sites at which selective ethyne hydrogenation to ethene can occur. The carbonaceous deposit on the support increases the selectivity to ethane formation by increasing the rate of ethene hydrogenation on support sites and by decreasing the effective diffusivity of ethyne in the pores. (235 Refs.)

### Supported Pd Catalyst Preparation Using Liquid Carbon Dioxide

J. KIM, G. W. ROBERTS and D. J. KISEROW, *Chem. Mater.*, 2006, 18, (20), 4710–4712

Liquid CO<sub>2</sub> (L-CO<sub>2</sub>) has an extremely low surface tension which makes it an excellent wetting agent. Pd/ $\alpha$ -Al<sub>2</sub>O<sub>3</sub> and Pd/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> pellet catalysts (1) were prepared using L-CO<sub>2</sub> to deposit Pd(hfac)<sub>2</sub> onto the supports, followed by reduction/activation using H<sub>2</sub> at 45–150°C. (1) have shown activity for the selective hydrogenation of the aromatic rings in polystyrene.

### Controlling Factors in the Direct Formation of H<sub>2</sub>O<sub>2</sub> from H<sub>2</sub> and O<sub>2</sub> over a Pd/SiO<sub>2</sub> Catalyst in Ethanol

Q. LIU and J. H. LUNSFORD, *Appl. Catal. A: Gen.*, 2006, 314, (1), 94–100

The direct formation of H<sub>2</sub>O<sub>2</sub> in EtOH over Pd/SiO<sub>2</sub> was studied under conditions that yield good selectivities for the peroxide, moderate rates of formation, and concentrations of H<sub>2</sub>O<sub>2</sub> that approach 2 wt.%. Cl<sup>-</sup> or Br<sup>-</sup> and protons (from H<sub>2</sub>SO<sub>4</sub>) are essential for limiting the combustion reaction. A selectivity for H<sub>2</sub>O<sub>2</sub> approaching 80% was achieved using 2 × 10<sup>-5</sup> M Br<sup>-</sup> and 0.12 M H<sub>2</sub>SO<sub>4</sub> with an O<sub>2</sub>:H<sub>2</sub> ratio of 15. Br<sup>-</sup> inhibits the loss of Pd from the support.

## HOMOGENEOUS CATALYSIS

### Pd(OAc)<sub>2</sub>/DABCO-Catalyzed Suzuki–Miyaura Cross-Coupling Reaction in DMF

J.-H. LI, Q.-M. ZHU and Y.-X. XIE, *Tetrahedron*, 2006, 62, (47), 10888–10895

For Suzuki–Miyaura cross-couplings using Pd(OAc)<sub>2</sub>/DABCO (1,4-diaza-bicyclo[2.2.2]octane), both aryl bromides and aryl chlorides reacted with arylboronic acids to form biaryls, heteroaryl-aryls, and biheteroaryls in moderate to excellent yields using DMF as the solvent. Additionally, the reactions of aryl bromides were carried out under relatively mild conditions. DMF is a highly polar solvent and may act as a ligand to promote the reaction.

### New Modular P-Chiral Ligands for Rh-Catalyzed Asymmetric Hydrogenation

O. G. BONDAREV and R. GODDARD, *Tetrahedron Lett.*, 2006, 47, (51), 9013–9015

Modular P-chiral ligands (1) derived from commercially available (*S*)- $\alpha,\alpha$ -diphenylprolinol have been prepared for the first time. (1) exhibited a high enantioselectivity in the Rh (prepared *in situ* from [Rh(COD)<sub>2</sub>][BF<sub>4</sub>]-catalysed hydrogenation of functionalised olefins such as methyl  $\alpha$ -acetamidoacrylate ( $\leq$  91% ee), methyl  $\alpha$ -acetylaminocinnamate ( $\leq$  95% ee), and dimethyl itaconate ( $\leq$  95% ee). Catalyst optimisation can be carried out easily by variation of the substituent attached to the P atom in (1).

### Rhodium(I) Complex with Hexylamine and Chloride Ligands, Catalytically Active in the Selective Hydrogenation of 1-Heptyne

D. A. LIPRANDI, E. A. CAGNOLA, M. E. QUIROGA and P. C. L'ARGENTIÈRE, *Ind. Eng. Chem. Res.*, 2006, 45, (17), 5836–5840

A Rh(I)-chloride-hexylamine complex (1) was obtained by reaction of RhCl<sub>3</sub> with hexylamine in toluene under Ar, at 353 K. (1) shows catalytic activity for 1-heptyne semihydrogenation at 303 K and 150 kPa in homogeneous as well as heterogeneous systems using  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> as support. (1) is tetracoordinated with an empirical formula [RhCl(NH<sub>2</sub>(CH<sub>2</sub>)<sub>5</sub>CH<sub>3</sub>)<sub>3</sub>]. When supported, (1) shows higher activity and selectivity than it does when it is unsupported.

## Osmium Catalyzed Dihydroxylation of 1,2-Dioxines: A New Entry for Stereoselective Sugar Synthesis

T. V. ROBINSON, D. K. TAYLOR and E. R. T. TIEKINK, *J. Org. Chem.*, 2006, 71, (19), 7236–7244

3,6-Substituted 3,6-dihydro-1,2-dioxines were dihydroxylated with OsO<sub>4</sub> to give 1,2-dioxane-4,5-diols (peroxy diols), in yields from 33% to 98%, and with de values ≥ 90%. These peroxy diols were then reduced to a stereospecific tetraol core with R<sub>1</sub>R<sub>2</sub>S<sub>3</sub>S<sub>4</sub> or “allitol” stereochemistry. The peroxy diols and their acetonide derivatives were also ring-opened with Co(II) salens to give hydroxy ketones such as psicose.

## FUEL CELLS

### Synthesis and Characterization of Pt/C Nanocatalysts Using Room Temperature Ionic Liquids for Fuel Cell Applications

X. XUE, C. LIU, T. LU and W. XING, *Fuel Cells*, 2006, 6, (5), 347–355

Pt/C nanocatalysts were prepared using room temperature ionic liquids as the solvent (Method (1)) and conventional preparation techniques (Method (2)), based on wet impregnation methods. (1) were homogeneously dispersed with a narrow size distribution. (1) were more active for electrooxidation of MeOH than (2). Surface area measurements of the Pt metal, conducted by electrooxidation of preadsorbed CO, indicated that (1) have higher surface area.

### Aerogel-Based PEMFC Catalysts Operating at Room Temperature

A. SMIRNOVA, X. DONG, H. HARA and N. SAMMES, *J. Fuel Cell Sci. Technol.*, 2006, 3, (4), 477–481

Pt/C-aerogel (1) with 22 nm pore size distribution and low Pt loading (0.1 mg cm<sup>-2</sup>) was tested in a PEMFC. Power densities up to 0.5 mW cm<sup>-2</sup> were achieved at 0.6 V in air/H<sub>2</sub> and 2 atm backpressure on both cathode and anode. Continuous cycling with upper potential sweep limits of 1.0 and 1.2 V led to degradation effects that resulted in decreasing of the electrochemical surface area of (1).

### Insights into the Distribution of Water in a Self-Humidifying H<sub>2</sub>/O<sub>2</sub> Proton-Exchange Membrane Fuel Cell Using <sup>1</sup>H NMR Microscopy

K. W. FEINDEL, S. H. BERGENS and R. E. WASYLISHEN, *J. Am. Chem. Soc.*, 2006, 128, (43), 14192–14199

The distribution of H<sub>2</sub>O throughout a self-humidifying PEMFC (1), operating at ambient temperature and pressure on dry H<sub>2</sub> and O<sub>2</sub>, was investigated *in situ* using <sup>1</sup>H NMR microscopy. The MEA consisted of unsupported HiSpec 1000 Pt black and HiSpec 6000 Pt-Ru black for the cathode and anode catalyst, respectively. The maximum power output from (1), while operating under conditions of constant external load, occurs when H<sub>2</sub>O(l) is first visible in the <sup>1</sup>H NMR image of the cathode flow field, and subsequently declines as this H<sub>2</sub>O(l) continues to build up.

### Monodisperse PtRu Nanoalloy on Carbon as a High-Performance DMFC Catalyst

Y. H. LEE, G. LEE, J. H. SHIM, S. HWANG, J. KWAK, K. LEE, H. SONG and J. T. PARK, *Chem. Mater.*, 2006, 18, (18), 4209–4211

Colloidal PtRu was prepared from the coreduction of Pt(acac)<sub>2</sub> and Ru(acac)<sub>3</sub> by 1,2-hexadecanediol in octyl ether in the presence of oleylamine and oleic acid as surfactants. PtRu/Vulcan C (1) was obtained by impregnation on the Vulcan C support; and the surfactant was removed by acetic acid treatment. In electrochemical experiments (1) is reported to have higher catalytic activity toward MeOH oxidation, compared with that of commercially available PtRu catalysts and earlier literature examples.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### In Situ Growth of CoPt Nanoparticles in Porous Germania Nanospheres

M. R. REGAN and I. A. BANERJEE, *Mater. Lett.*, 2007, 61, (1), 71–75

Mesoporous nanospheres of GeO<sub>2</sub> (1) were used as a matrix to grow magnetic CoPt nanoparticles (2). (1) were prepared by biomineralisation *via* the recognition of the peptide sequence T-G-H-Q-S-P-G-A-Y-A-A-H. The size of (2) embedded in (1) is in the 8–9 nm range. The porosity of the nanocomposites was confirmed by nitrogen isotherm analysis. This preparative route has potential for obtaining new optomagnetic materials.

### Microstructure Development and Electrical Properties of RuO<sub>2</sub>-Based Lead-Free Thick Film Resistors

M. G. BUSANA, M. PRUDENZIATI and J. HORMADALY, *J. Mater. Sci.: Mater. Electron.*, 2006, 17, (11), 951–962

Pb-free thick film resistive compositions, based on RuO<sub>2</sub> as the conducting phase and bismuthate glasses, were prepared. The sheet resistance spans two decades by changing the RuO<sub>2</sub> fraction from ~ 14–52 wt.%. Resistors can be fabricated with good reproducibility; and their temperature coefficient of resistance is ± 300 ppm/°C.

### Investigation of RuO<sub>2</sub>/4H-SiC Schottky Diode Contacts by Deep Level Transient Spectroscopy

D. BUC, L. STUCLIKOVA, U. HELMERSSON, W. H. CHANG and I. BELLO, *Chem. Phys. Lett.*, 2006, 429, (4–6), 617–621

Schottky diodes (1) were prepared on *n*-type silicon carbide (4H-SiC) by deposition of RuO<sub>2</sub> contacts. The electrical and electronic properties of (1) were investigated by current–voltage and capacitance–voltage methods, and deep level transient spectroscopy. Deep energy levels with thermal activation energies of ~ 0.27, 0.45, 0.56, 0.58 and 0.85 eV referenced to the conduction band minimum were revealed. The two energy levels at 0.56 and 0.85 eV are induced by divacancies and the incorporation of Ru impurities into the SiC interfacial region.