

Abstracts

CATALYSIS – APPLIED AND PHYSICAL ASPECTS

Catalytic Properties of Ru Nanoparticles Embedded on Ordered Mesoporous Carbon with Different Pore Size in Fischer-Tropsch Synthesis

K. Xiong, Y. Zhang, J. Li and K. Liew, *J. Energy Chem.*, 2013, **22**, (4), 560–566

3 wt% Ru NPs embedded on ordered mesoporous carbon (OMC) catalysts with different pore sizes were obtained by autoreduction between Ru precursors and C sources at 1123 K. The catalyst activity for Fischer-Tropsch synthesis (FTS) was measured in a fixed bed reactor. These 3 wt% Ru-OMC catalysts with different pore sizes were more stable than 3 wt% Ru/AC catalyst during the FTS reactions because Ru NPs were embedded on the C walls, suppressing particle aggregation, movement and oxidation. The catalytic activity and C₅₊ selectivity increased with increasing pore size; CH₄ selectivity had the opposite trend.

CATALYSIS – REACTIONS

Platinum Catalysed Hydrosilylation of Propargylic Alcohols

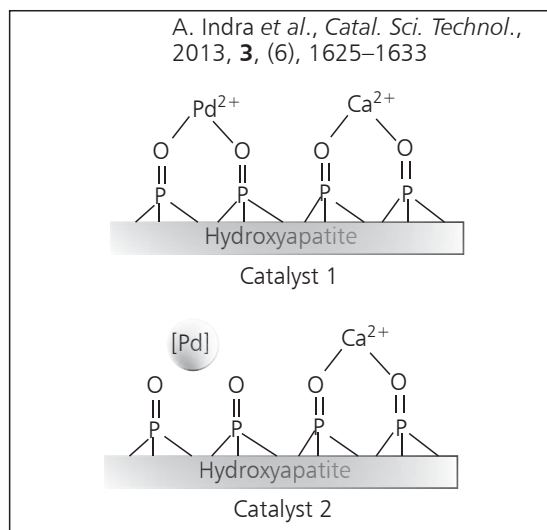
C. A. McAdam, M. G. McLaughlin, A. J. S. Johnston, J. Chen, M. W. Walter and M. J. Cook, *Org. Biomol. Chem.*, 2013, **11**, (27), 4488–4502

The selective synthesis of *E*-vinyl silanes derived from propargylic alcohols can be achieved using PtCl₂/XPhos. The reaction provides a single regioisomer at the β-position with *E*-alkene geometry. Good reactivity was observed at extremely low catalyst loadings. This methodology was extended to a one-pot hydrosilylation Denmark–Hiyama coupling.

Hydroxyapatite Supported Palladium Catalysts for Suzuki–Miyaura Cross-Coupling Reaction in Aqueous Medium

A. Indra, C. S. Gopinath, S. Bhaduri and G. K. Lahiri, *Catal. Sci. Technol.*, 2013, **3**, (6), 1625–1633

Catalyst **1** was prepared by the immobilisation of [Pd(COD)Cl₂] on hydroxyapatite. Catalyst **2** was prepared by reduction of **1** with sodium borohydride in ethanol. With **1** electronically neutral, electron rich, electron poor or sterically hindered aryl boronic acids and aryl halides underwent Suzuki–Miyaura cross-coupling in water as the solvent. Catalyst **1** with Pd²⁺ exhibited much better catalytic activities than **2**.



Conversion of Carbohydrate Biomass to γ -Valerolactone by Using Water-Soluble and Reusable Iridium Complexes in Acidic Aqueous Media

J. Deng, Y. Wang, T. Pan, Q. Xu, Q.-X. Guo and Y. Fu, *ChemSusChem*, 2013, **6**, (7), 1163–1167

Carbohydrate biomass can be converted to γ -valerolactone in acidic aqueous media using a catalytic method. Water-soluble Ir complexes were extremely active for providing γ -valerolactone in high yields with high TONs. The homogeneous Ir catalysts could be recycled by using a simple phase separation.

EMISSIONS CONTROL

Preparation and Characterization of Pt-Rh-Pd/Al₂O₃ Three Way Catalyst

C. Kuang, K. Liu and F. Li, *Precious Met. (Chin.)*, 2013, **34**, (1), 17–20

Pt-Rh-Pd/Al₂O₃ catalysts were prepared by: (a) successive impregnation method and (b) co-impregnation method. TPD and XRD were used to investigate the catalytic activity. The co-impregnation method gave a catalyst of catalytic performance superior to that of the successive impregnation method. The catalytic process proceeds according to the Langmuir-Hinshelwood mechanism.

Synthesis of Pd/Al₂O₃ Coating onto a Cordierite Monolith and Its Application to Nitrite Reduction in Water

A. Devard, M. A. Ulla and F. A. Marchesini, *Catal. Commun.*, 2013, **34**, 26–29

A stable layer of Pd/Al₂O₃ on the walls of a cordierite (COR) monolith was obtained by forming an alumina layer *via* washcoat and then immersing into a PdCl₂ solution. Pd/Al₂O₃-COR was shown to be active in the reduction of nitrites and had the advantage of generating low amounts of ammonium, indicating a greater selectivity to nitrogen. The coating had good adherence even after the reaction in a batch system under stirring and under a pH ~5.

Pd-Doped Perovskite: An Effective Catalyst for Removal of NO_x from Lean-Burn Exhausts with High Sulfur Resistance

X. Li, C. Chen, C. Liu, H. Xian, L. Guo, J. Lv, Z. Jiang and P. Vernoux, *ACS Catal.*, 2013, **3**, (6), 1071–1075

The Pd-doped La_{0.7}Sr_{0.3}CoO₃ perovskite (La_{0.7}Sr_{0.3}C_{0.97}Pd_{0.03}O₃) has been shown to be an effective LNT catalyst operating in periodically alternate lean/rich atmospheres. This smart perovskite displayed excellent NO_x reduction activities for lean-burn exhausts over 275–400°C, as well as an extremely high S tolerance. The results indicate that Pd is dissolving into or segregating out of perovskite in lean-burn and fuel-rich atmospheres.

FUEL CELLS

***In Situ* Measurement of Active Catalyst Surface Area in Fuel Cell Stacks**

E. Brightman, G. Hinds and R. O'Malley, *J. Power Sources*, 2013, **242**, 244–254

The application of a galvanostatic technique that enables *in situ* monitoring of electrochemical surface area (ECSA) in each cell throughout the lifetime of a PEMFC stack was proven. The concept was demonstrated at single cell (Pt/C anode/cathode, perfluorosulfonic acid membrane) level using both H adsorption and CO stripping, and the H adsorption method was extended to stack testing. The undesirable effects of H₂ crossover on the measurement may be minimised by appropriate selection of current density and by working with dilute H₂ on the anode electrode.

Efficient Pt/Carbon Electrocatalysts for Proton Exchange Membrane Fuel Cells: Avoid Chloride-Based Pt Salts!

N. Job, M. Chatenet, S. Berthon-Fabry, S. Hermans and F. Maillard, *J. Power Sources*, 2013, **240**, 294–305

A Pt/C xerogel catalyst with 2 nm Pt particles was prepared by impregnation with H₂PtCl₆ using the

strong electrostatic adsorption method. Increasing the reduction temperature and duration gave better cleaning of the Pt surface and improved the electrocatalytic performance. The effect of Cl contamination was investigated on two model reactions: the electrochemical CO_{ads} oxidation and the ORR.

Preparation of Electrocatalysts for Polymer Electrolyte Fuel Cell Cathodes from Au-Pt Core-Shell Nanoparticles Synthesized by Simultaneous Aqueous-Phase Reduction

W. Yamaguchi and Y. Tai, *J. Fuel Cell Sci. Technol.*, 2013, **10**, (4), 041006 (5 pages)

PVP-protected Au-Pt core-shell NPs were prepared by simultaneous aqueous phase reduction of Au and Pt, and they were deposited on C black support. The obtained powder was processed in air at 170°C to remove the PVP. Stability of the core-shell catalyst in water was improved after the removal of PVP. The oxidation state of the Pt shell was found to be very close to zero. The Au-Pt core-shell catalyst exhibited mass activity 20% higher than that of a Pt catalyst.

APPARATUS AND TECHNIQUE

Flexible Palladium-Based H₂ Sensor with Fast Response and Low Leakage Detection by Nanoimprint Lithography

S. H. Lim, B. Radha, J. Y. Chan, M. S. M. Saifullah, G. U. Kulkarni and G. W. Ho, *ACS Appl. Mater. Interfaces*, 2013, **5**, (15), 7274–7281

High resolution and high throughput patterning of Pd gratings over a 2 cm × 1 cm area on a rigid substrate was achieved by heat treating nanoimprinted Pd benzyl mercaptide at 250°C for 1 h. A flexible and robust H₂ sensing device was fabricated by subsequent transfer nanoimprinting of these Pd gratings into a polycarbonate film at its glass transition temperature. At ambient pressure and temperature, the sensor showed a fast response time of 18 s at a H₂ concentration of 3500 ppm.

ELECTROCHEMISTRY

Platinum Ordered Porous Electrodes: Developing a Platform for Fundamental Electrochemical Characterization

B. Kinkad, J. van Drunen, M. T. Y. Paul, K. Dowling, G. Jerkiewicz and B. D. Gates, *Electrocatalysis*, 2013, **4**, (3), 179–186

A set of high surface area Pt electrodes with an

ordered porous structure (Pt-OP electrodes) were prepared by controlled electrodeposition of Pt through a self-assembled array of spherical particles and subsequent removal of the spherical templates by solvent extraction. The Pt-OP electrodes had clean Pt surfaces and a large ECSA resulting from both the porous structure, and the nano- and micro-scale surface roughness. The Pt-OP electrodes exhibited a surface area enhancement comparable to commercial electrocatalysts.

MEDICAL AND DENTAL

Water-Soluble Platinum(II) Complexes of Reduced Amino Acid Schiff bases: Synthesis, Characterization, and Antitumor Activity

L.-J. Li, C. Wang, C. Tian, X.-Y. Yang, X.-X. Hua and J.-L. Du, *Res. Chem. Intermed.*, 2013, **39**, (2), 733–746

Water-soluble Pt(II) complexes of reduced amino acid Schiff bases were synthesised and characterised. The complexes were tested for their DNA interaction with salmon sperm DNA, and their *in vitro* anticancer activities were validated against HL-60, KB, BGC-823 and Bel-7402 cell lines by the MTT assay. The cytotoxicity of one complex was better than that of cisplatin against BGC-823 and HL-60 cell lines, and showed close cytotoxic effect against Bel-7402 cell line.

Ruthenium (II) Polypyridyl Complexes Stabilize the bcl-2 Promoter Quadruplex and Induce Apoptosis of Hela Tumor Cells

C. Wang, Q. Yu, L. Yang, Y. Liu, D. Sun, Y. Huang, Y. Zhou, Q. Zhang and J. Liu, *BioMetals*, 2013, **26**, (3), 387–402

The interaction between GC-rich sequence of bcl-2 gene P1 promoter (Pu39) and $[\text{Ru}(\text{bpy})_2(\text{tip})]^{2+}$, **1**, and $[\text{Ru}(\text{phen})_2(\text{tip})]^{2+}$, **2**, was investigated by UV-vis, fluorescence spectroscopy, circular dichroism, fluorescence resonance energy transfer melting assay and polymerase chain reaction stop assay. The results indicated that the two complexes can effectively stabilise the G-quadruplex of Pu39. **2** exhibited greater

cytotoxic activity than **1** against human Hela cells and can enter into Hela cells to effectively induce apoptosis. Further experiments found that **1** and **2** had as potent inhibitory effects on ECV-304 cell migration as suramin.

NANOTECHNOLOGY

A Simple Method for Producing Colloidal Palladium Nanocrystals: Alternating Voltage-Induced Electrochemical Synthesis

J. E. Cloud, K. McCann, K. A. P. Perera and Y. Yang, *Small*, 2013, **9**, (15), 2532–2536

Alternating voltage-induced electrochemical synthesis (AVIES) gave well-dispersed, size-controlled, single-crystalline, colloidal Pd nanocrystals (Pd-NCs). An alternating voltage was applied to 2 Pd wires inserted in an electrolyte solution containing capping ligands. Pd-NCs were directly ejected from the Pd electrodes through cathodic reduction of the PdO intermediates. The Pd-NCs were soluble in either polar or non-polar solvents, depending on the nature of the capping ligands.

PHOTOCONVERSION

Light Extraction Enhancement in Organic Light-Emitting Diodes Based on Localized Surface Plasmon and Light Scattering Double-Effect

Y. Gu, D.-D. Zhang, Q.-D. Ou, Y.-H. Deng, J.-J. Zhu, L. Cheng, Z. Liu, S.-T. Lee, Y.-Q. Li and J.-X. Tang, *J. Mater. Chem. C*, 2013, **1**, (28), 4319–4326

The performance of OLEDs was improved by incorporating Pt₃Co alloy NPs into the devices as the anodic buffer layer. The enhancement in the current efficiency and EL intensity was achieved without affecting the spectral intensity distribution. A study on the devices with and without unannealed Pt₃Co alloy NPs found that the enhanced efficiency was mainly due to the resonance of localised surface plasmon.

