

Patents

CATALYSIS – APPLIED AND PHYSICAL ASPECTS

Shaped Catalyst Layers

Johnson Matthey Plc, *World Appl.* 2012/032,325

An additive layer method is used to produce a catalyst. A layer of powdered catalyst preferably selected from Pt, Pd, Ir, Ru or Re or a catalyst support powder is formed into a layer; the layer is bound or fused into a predetermined pattern; these steps are repeated layer upon layer to form a shaped unit; and optionally a catalytic material is applied to the shaped unit.

CATALYSIS – REACTIONS

Production of Linear Saturated Alkanes

Saltigo GmbH, *European Appl.* 2,415,738; 2012

The dehydroxymethylation of primary linear alcohols to produce linear saturated alkanes is carried out in the presence of a Ru or Rh catalyst, preferably Ru/C, at 1–250 bar and 150–250°C. 0.1–10 wt% of the catalyst is used. The starting material is a primary alcohol, ROH, where R is a saturated straight-chain linear alkyl radical with 8–24 C atoms.

Ruthenium Catalyst for Conversion of Cellulose

BIOecon Int. Holding NV, *European Appl.* 2,431,394; 2012

Cellulose is simultaneously hydrolysed and hydrogenated. The process consists of: (a) a cellulose-containing feedstock (comprising of lignocellulose and hemicellulose) is mixed with an ionic liquid in a reactor where a Ru/C catalyst is present at <80°C, preferably below 70°C. The ionic liquid consists of ZnCl₂·4H₂O. The undissolved components, consisting of lignin, are removed from the ionic liquid and used to generate H₂; (b) a H₂-containing gas is admitted to the reactor; and (c) the temperature of the reactor is increased to 80–220°C and is maintained for between 0.5 h and 6 h. Cellulose is converted to sorbitol at a yield of >90%.

Catalytic Conversion of Sugars to Polyethers

Carter Technol., *US Appl.* 2012/0,065,363

Sugars (monosaccharides and disaccharides) are catalytically converted to polyethers in an acid medium containing 0.1%–80% metal sulfates at 75–250°C. Catalysts possessing a degree of symmetry are formed from transition metal compounds comprising of Pt,

Pd, Rh, Ru, Ir, Os, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zr, Nb, Mo, Ag, Hf, Ta, W, Re or Au.

Dehydrogenation of Hydrocarbons

Johnson Matthey Plc, *British Appl.* 2,486,317; 2012

A process for dehydrogenation of hydrocarbons having from 2 to 24 C atoms is carried out using a catalyst containing <0.1 wt%, preferably <0.05 wt%, of a metal selected from Pt, Pd, Rh, Ru, V, Cr, Mn, Fe, Co, Mo, Ni or Au supported on Al₂O₃, SiO₂, MgO, ZrO₂, TiO₂, CeO₂, SiO₂-Al₂O₃, C black or a mixture. The process is carried out at 650–750°C and may be in the absence of O₂. The product is an alkene.

EMISSIONS CONTROL

Gold-Palladium Catalyst in Exhaust System

Caterpillar Inc, *US Appl.* 2012/0,051,992

A catalyst consisting of ~0.8–1.2 wt% Au and ~0.4–0.6 wt% Pd supported on TiO₂, is applied to a particulate filter. The exhaust stream is flowed over the catalyst, CO is oxidised at ~84°C and the hydrocarbon is oxidised at ~206°C. NO is oxidised to NO₂.

FUEL CELLS

Platinum-Transition Metal Catalyst

Elcomax GmbH, *World Appl.* 2012/028,313

A process for preparing Pt-transition metal catalyst particles comprises of: (a) providing M_xN_y, where M is Pt; N is an element chosen from Co, Ni, Fe, Cr, Cu, Ti, Mn and W or any intermetallic compound of two or more elements of this group; x and y are the weight fractions, 0 < x < 1 and 0 < y < 1 and x + y ≤ 1; (b) treating the catalyst particles in acid selected from HClO₄, H₃PO₄, HNO₃, H₂SO₄, HCl, HCOOH or CH₃COOH; and (c) depositing Pt on the catalyst treated in step (b). The catalyst particles are used in fuel cells.

METALLURGY AND MATERIALS

Nanocomposite with Multiple Uses

Indian Institute of Technology, *World Appl.* 2012/028,944

A nanocomposite is formed from reduced graphene oxide and nanoparticles of Pt, Pd, Rh, Ru, Ir, Au, Ag, Co, Mn, Fe, Te, Cu, Mo, Cr, or Ce. The particles may be non-spherical and may have shapes such as tetrahedron, triangle, prism, rod, etc. The nanocomposite may be

used to adsorb heavy metals such as Pb, Mn, Cu, Ni, Cd and Hg from water; as a catalyst for Suzuki couplings, hydrogenation, dehydrogenation or petroleum cracking; in fuel cells; or in hydrogen storage.

Platinum-Rhodium Jewellery

C. Hafner GmbH + Co KG, *German Appl.* 10/2010/026,930; 2012

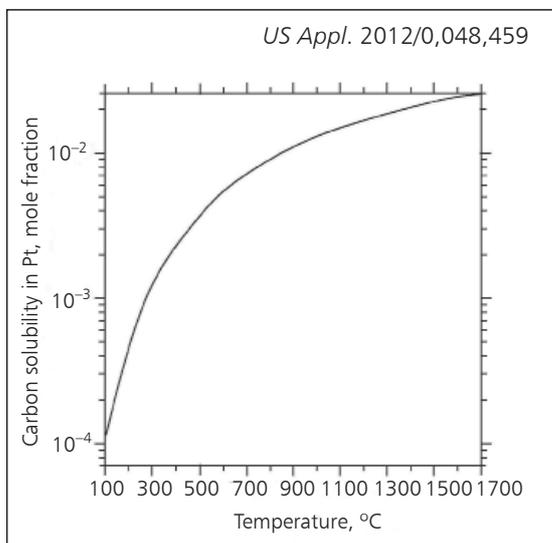
A tarnish-resistant precious metal jewellery alloy containing 40–70 wt% Rh and 60–30 wt% Pt for the manufacture of watches and jewellery is claimed. Optionally ≤ 20 wt% of Ru, Ir and/or Au or ≤ 30 wt% Pd may be included. The jewellery is made using a lost wax process.

APPARATUS AND TECHNIQUE

Platinum-Containing Parts for Glass Making

W. G. Dorfeld and S. L. Schiefelbein, *US Appl.* 2012/0,048,459

A process to remove the carbon contamination in the Pt-containing components for glass making involves two Pt-containing components welded together to form an assembly. An O_2 -generating material (oxide of Sn) is disposed in an interstitial volume between the two Pt-containing components. The assembly is heated to 1450°C for ≥ 12 h in an atmosphere of ≥ 20 vol% O_2 .



Moulds for Press Forming Optical Glass Elements

Olympus Corp, *Japanese Appl.* 2012-051,790

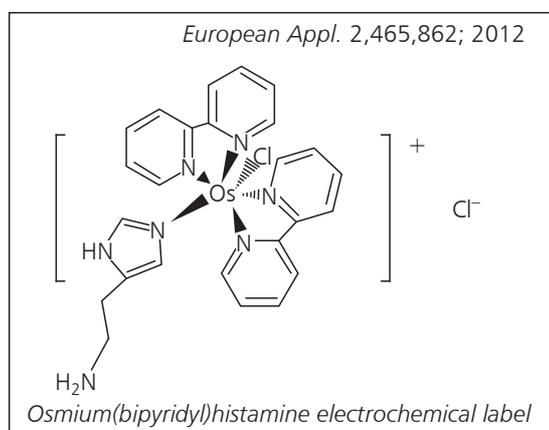
Moulds are made by forming surface layers (containing Pt, Pd, Ir, Os, Ru, Re, Hf, Ta or their alloys) on a hard alloy or SiC-based substrate. This is then heated to form oxidised

layers. A part of the oxidised surfaces are removed and further heated for oxidation. These moulds provide stable moulding performance continually without melt adhesion and are suitable for moulding lenses.

Osmium Complexes for Biosensors

Roche Diagnostics GmbH, *European Appl.* 2,465,862; 2012

A novel Os complex-based electrochemical species is claimed for use in detecting an analyte in a liquid sample. The complex is selected such that its substituents will bind to one or more of: a bio warfare agent, an abused substance, a therapeutic agent, an environmental pollutant, a protein or a hormone.



ELECTROCHEMISTRY

Composite Electrode

I. D. Kim *et al.*, *US Appl.* 2012/0,063,058

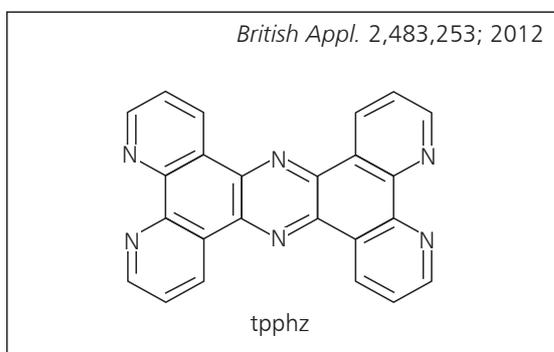
A composite electrode active material comprises of $M_{1-x}Ru_xO_3$, where M is selected from Sr, Ba and Mg, and x is between 0.05–0.5. The composite material consists of nanofibre (50–3000 nm in diameter) and comprises nanoparticles (1–20 nm in size). The procedure for manufacturing the composite electrode active material is: (a) preparing a spinning solution containing a precursor of M oxide, a precursor of Ru oxide, a polymer and a solvent; (b) spinning the spinning solution on a collector to produce a nanofibre web (0.5–100 μ m in thickness) having $M_{1-x}Ru_xO_3$ precursor, then performing thermocompression at 200°C to enhance the adhesion between the collector and the nanofibre web; (c) heat treating the nanofibre web at 300–650°C to remove the polymer; and (d) milling the porous nanofibre web to create an electrode active material comprising nanorods, microrods, nanoparticles, fibrils having nanoparticles or a fibril network.

MEDICAL AND DENTAL

Ruthenium-Based Dual Function Complexes

University of Sheffield, *British Appl.* 2,483,253; 2012

Antineoplastic agents consist of mononuclear complexes of Ru(II), Os(II) or Ir(II), preferably Ru(II). The complexes contain a tpphz ligand and have dual functioning imaging and therapeutic properties. They may be used in photodynamic therapy and as chemotherapeutic agents. Their cytotoxicity is comparable to Pt-based chemotherapeutics and they may be used for patients who display resistance to Pt-based chemotherapeutics.



REFINING AND RECOVERY

Recovery of Platinum

Asahi Pretec Corp, *Japanese Appl.* 2012-057,193

A process is claimed for recovering Pt from a Ru-containing acidic Pt solution by adding KCl in a stoichiometrically excess amount of K ion relative to Pt, therefore obtaining K chloroplatinate. This is dissolved in water, the pH of the solution is adjusted to 1–7 and K chloroplatinate is recrystallised from the solution (preferably in the presence of KCl).