DOI: 10.1595/147106709X436705

NEW PATENTS

CATALYSIS – APPLIED AND PHYSICAL ASPECTS

Improved Heterogeneous Palladium Catalyst

ALMQUEST AB *European Appl.* 1,994,983

A stable Pd catalyst formulation is claimed. The porous carrier consists of a core and covalently-bonded ion exchange groups in which > 90% (preferably > 95%) of the ions are $HCOO^-$. These reduce Pd in a Pd(II) salt and facilitate Pd(0) deposition on the surface of the carrier at reaction temperature 30–70°C (preferably 45–55°C). The catalyst is suitable for Heck, Suzuki-Miyaura and Buchwald-Hartwig reactions.

CATALYSIS – INDUSTRIAL PROCESS

Novel Fluoropolyether Compositions

SHIN-ETSU CHEM. CO LTD *European Appl.* 1,995,278

A composition containing a polyfluorodialkenyl compound, a fluorinated organohydrogenpolysiloxane and a pgm complex, usually Pt (0.1–500 ppm w/w), to catalyse the curing process is combined with hydrophobic SiO_2 powder, a Si-based tackifier and a dispersant. These allow the fluoropolyether to adhere to organic resins but not to metal moulds so that composite resin-rubber moulded parts can be produced.

Production of Alcohols Using Carbon Dioxide

HITACHI CHEM. CO LTD *European Appl.* 2,000,453

Alcohols are produced by hydroformylation of an organic compound using CO_2 rather than CO as a raw material. The reaction is catalysed by a Ru compound (preferably a clustered Ru compound such as $Ru_2(CO)_6Cl_4$ or $Ru_3(CO)_{12}$) combined with an acid and optionally a halide salt. The reaction proceeds at 100–180°C and 1–50 MPa. High yields are claimed.

Stable Catalyst for Metathesis of Nitrile Rubber

LANXESS DEUTSCHLAND GmbH *U.S. Patent* 7,470,750

Degradation of nitrile rubbers is achieved through olefin metathesis catalysed by a Ru or Os complex bearing an imidazolidine ligand and a carbene ligand having a phosphine radical. The complex is described as forming a stable solution in the solvents which would typically be used for the process, even at high temperatures, and no gelling of the rubber is observed.

EMISSIONS CONTROL

Barium-Free Catalyst for Lean NOx Trap

FORD GLOBAL TECHNOL. LLC *European Appl.* 1,990,081

A novel formulation and production process are claimed for a LNT catalyst which gives efficient NOx conversion at low temperatures. High-temperature calcination of the base metal oxide takes place prior to the addition of the pgms, preferably Pt-Rh, Pt-Pd or Pt-Pd-Rh. The base metal is Pr or Pr-La which is claimed to confer advantages to the formulation over commercially available Ba-based mixtures.

Enhanced Diesel Particulate Filter

MAZDA MOTOR CORP *Japanese Appl.* 2008-178,766

Collection of ultrafine PM in vehicle exhaust by a DPF is enhanced though use of a Pt or Rh catalyst layer containing micropores of 0.1–0.2 μm diameter. The catalyst layer is deposited on an undercoat which has the dual function of suppressing exfoliation of the catalyst layer and promoting combustion (the co-catalyst is a Ce-, Zr- or perovskite-type composite oxide).

Catalysts for Decomposition of Organic Acids

NIPPON SHOKUBAI CO LTD *Japanese Appl.* 2008-238,063

A noble metal selected from Pt, Pd, Rh, Ru, Ir and Au (preferably Pt or Pd) is deposited on a Ce-Zr or a Ce-Zr-X compound oxide, where X = La, Y or Pr. Al and/or W can also be added. Efficient decomposition of organic acids with C_1–C_6 in industrial flue gas is achieved. High activity and durability are claimed.

FUEL CELLS

Platinum Alloy for Membrane Electrode Assembly

JOHNSON MATTHEY PLC *World Appl.* 2009/013,540

A new Pt alloy catalyst PtX is described which contains ~ 10–80 at.% Pt at the surface, which is at least 25% greater than the content of Pt in the bulk (~ 5–50 at.%). X may be Ru, Rh, Pd, Ir, Os, Au, Ag, Sn or Ru-Sn (preferably Ru and/or Sn). The catalyst can be unsupported or supported on a dispersed material such as conductive C. Further, it can be incorporated into an electrode, a catalysed membrane or a transfer substrate, and may constitute various parts of a MEA in a polymer electrolyte membrane fuel cell.

Catalyst for a Direct Carbon Fuel Cell

DIRECT CARBON TECHNOL. LLC *World Appl.* 2008/121,128

An anode is formed by depositing discrete particles of catalytic material on a ceramic-metallic (cermet) composite such as Ni-Cu/Y_2O_3-stabilised ZrO_2 or Ni-Cu/Gd_2O_3-doped CeO_2. The catalyst is selected from Pt, Pd, Rh, Ir, Ru, Os, Re and Au, or a mixture, and particles 1 nm–50 mm in diameter are separated by up to 100 times that distance. The anode is suitable for high temperature use (500–1200°C) typical in a DCFC.

METALLURGY AND MATERIALS

Iridium Alloys for High-Temperature Applications

JOHNSON MATTHEY PLC *U.S. Patent* 7,481,971

Ir alloys are presented that include Rh (0.1–2.5 wt.%) and at least one of W (0.01–5 wt.%) and Zr (0.01–0.5 wt.%). They may also contain Pt (0.1–5 wt.%) and/or one or more of Ta, Nb, Mo, Cr, Ce, Sc, Lu, Co, Ni, Hf, Y, Ti, Ru and Pd (each 0.01–10 wt.%). The alloys are claimed to show significantly improved performance in high-temperature oxidising environments compared to pure Ir. Potential applications include electrode materials in spark plugs, crucibles and fabricated components for the glass and chemical industries.

Platinum Jewellery Alloy

P. TEWS *U.S. Appl.* 2008/0,298,997

Alloys of Pt containing either (wt.%) 55–63 Pt or 70–79.5 Pt with the remainder being Cu and Co are described. Small amounts of Pd, Ir, Ru or alternatively In and Ga may also be added to the 70–79.5 wt.% Pt alloy. The colour of the alloy is claimed to correspond to a white PtCu950 alloy and it can be cast to form a variety of jewellery items such as rings, necklaces, watch bands or watch bodies.

APPARATUS AND TECHNIQUE

Non-Radioactive Tracers

JOHNSON MATTHEY PLC *U.S. Appl.* 2009/0,025,470

A tracer based on a non-radioactive metal selected from Pt, Pd, Rh, Ru, Ir, Os, Cs, Nb, Ta, Te, Tb, La, Au, Ag, Re, Hf, In, a La-series metal, or a salt thereof, is inserted into an underground oil or natural gas reservoir. Presence and extent of flow from the targeted reservoir can be determined when samples are collected at the wellhead and analysed for the tracer. The tracer may be inserted into the reservoir using a perforation tool, and may take the form of a physical disc, rod, wire, or coating, finely-divided particles or water- or hydrocarbon-soluble salts.

BIOMEDICAL AND DENTAL

Pd-Radioisotope for Treatment of Pterygium

SEOUL NATL. UNIV. HOSPITAL *European Appl.* 1,997,532

An applicator is described which administers a dose of radiation to the surface of the eye to treat either a conjunctival growth (pterygium) or post-operative glaucoma. The radiation dose is obtained from a mixture of ^{32}P and ^{103}Pd radioisotopes, which are claimed to offer significant advantages over the traditional ^{90}Sr radioisotope. ^{103}Pd is necessary to modulate the dose, as the dose from ^{32}P may attenuate too rapidly.

Ru-Based Compounds for the Treatment of Cancer

UNIV. NEUCHÂTEL *European Appl.* 2,019,109

Trimetallic clusters are described which have been shown to have high cytotoxic activity. The metals can be selected from any of Ru, Os, Ir, Rh, Co and Fe, or a combination, but trinuclear Ru-arene clusters are preferred. Also presented is a pharmaceutical composition containing the compound, which may find particular application in treating metastasis.

Iridium Oxide Nanowire Used as Neural Sensor

SHARP LAB. OF AMERICA INC *U.S. Appl.* 2008/0,299,381

A method for forming an IrOx nanowire neural sensor array is described for application in the treatment of blindness caused by *retinitis pigmentosa* etc. IrOx is biocompatible and can be grown on a transparent conducting electrode, making it suitable for imaging applications. The nanowire technology facilitates a high resolution sensor as very precise areas of the retina can be electrically stimulated through the IrOx neural interface.

PHOTOCONVERSION

White OLEDs

Y. CHI *et al.* *U.S. Appl.* 2009/0,001,875

A design for stable organic white light-emitting devices is presented, based on a combination of Os and Ir complexes. The Os complexes emit in the range 580–630 nm (orange-red light) and the Ir complexes emit in the range 450–500 nm (blue-green light). An OLED emitting virtually white light is obtained. External quantum efficiency and luminous efficiency are stated as 28.8% and 47.5 lm W^{-1} (17% and 28 lm W^{-1} in the forward-viewing direction).

Novel Organometallic Complex for DSSC

S. M. ZAKKEERUDDIN *et al.* *U.S. Appl.* 2009/0,000,658

Heteroleptic polypyridyl complexes of Ru, Os or Fe (preferably Ru) containing 4,4′-disubstituted bipyridines as anchoring ligands are described. The complexes are formulated to have improved light-harvesting capacity compared to known polypyridyl Ru complexes. A dye sensitised solar cell containing the complex as a photosensitising dye in combination with a compacting compound is claimed. This mixture is theorised as forming a closely-packed hydrophobic monolayer on the anode semiconductor, insulating against back electron transfer and thereby increasing the cell open circuit voltage. The molten salt may offer improved thermal stability over electrolyte solutions.

REFINING AND RECOVERY

Separating Apparatus and Method for Fire Assay

ANGLO AMERICAN PLATINUM CORP LTD *World Appl.* 2009/007,911

A novel apparatus for fire assay determination of Au and pgms in ore is described which permits controlled venting of trapped air during casting and is constructed such that the collector material is not exposed to oxidation between the separation vessel and the collector mould. A method for quantitatively separating molten slag and collection material is presented.

SURFACE COATINGS

Pt-Al Coatings on Gas Turbine Components

MTU AERO ENGINES GmbH *World Appl.* 2008/145,093

A monophasic Pt-Al coating is obtained after diffusion heat treatment (0.2–4 h) and aluminising of the Pt-layer (3–11 h), specified as < 4 μm thick. A biphasic coating requires an aluminising period of 8–15 h and a Pt-layer of 5–6 μm. A single-phase PtAl layer based on a Pt coating of 1–2 μm is also claimed.

High-Speed Plating of Palladium

ROHM & HAAS ELECTRON. MATER. LLC *European Appl.* 2,017,373

Methods for NH_3-based bath deposition of Pd and Pd-based alloys at current densities of 10–100 A dm^{-3} are claimed. Low levels (< 50 g l^{-1}) of free NH_3 in the electroplating baths are maintained by adding urea. The method is suitable for producing Pd or Pd-alloy coatings on electronic components and jewellery.