

NEW PATENTS

METALS AND ALLOYS

Palladium Alloy

DERINGER NEY INC *European Appl.* 1,756,325

A family of Pd alloys are claimed which can be used for in-body medical devices or for electrical contacts such as low-noise signal sliding or static contacts. The alloys have high strength, radio opacity and biocompatibility and are workable. Components may include Pd and B plus at least one element selected from Ru, Ir, Pt, Re, W, Au, Zr, Co, Ni and Ta; preferably (in %): 45–99.95 Pd, 0.005–1.5 B, 0–25 Re and optionally 0–8 Ru. Alternative compositions include Pd and Ru with at least one element selected from Ir, Pt, B, Re, W, Au, Zr, Co, Ni and Ta.

Osmium Diborides

REGENTS UNIV. CALIFORNIA *European Appl.* 1,761,463

Os compounds of formula $Os_xM_{1-x}B_2$ (1) where $M = Ru, Re$ or Fe and $0.01 \leq x \leq 1$; except when $x \neq 1$ and $M = Re$, then $0.01 \leq x \leq 0.3$, are claimed which are ultra-hard and incompressible. (1) have Vickers hardness $\geq 2000 \text{ kg mm}^{-2}$ and can be used in place of other ultra-hard materials for abrasives, protective coatings or the surfaces of cutting tools.

PHOTOCHEMISTRY

Electroluminescent Iridium Complexes

OLED T LTD *European Appl.* 1,761,614

Electroluminescent devices incorporate an electroluminescent layer containing complexes of Ir, Ru, Rh, Pd, Pt or Os, preferably Ir. Ligands may include 2-benzo[*b*]thiophenyl and benzimidazole, and give complexes such as bis[thiophen-2-yl-pyridine- C^2, N^1]-2-(2-pyridyl)-benzimidazole iridium.

Facial Tris-Cyclometallated Complexes

EASTMAN KODAK CO *U.S. Appl.* 2007/0,078,264

A process for forming a facial tris-cyclometallated Ir or Rh complex isomer includes a step of heating a solution of a meridional Ir or Rh complex isomer in an unsubstituted or halogenated hydrocarbon solvent or a mixture, to a temperature of $\geq 150^\circ\text{C}$. Ligands may include at least one 1-phenylisoquinoline, 3-phenylisoquinoline or 2-phenylquinoline group, and optionally a phenylpyridine group.

ELECTRODEPOSITION AND COATINGS

Ruthenium Plating Seed Layer

IBM CORP *World Appl.* 2007/044,305

A plating seed layer for an interconnect structure contains an O/N transition region between bottom and top plating seed regions, which may contain Ru, Ir or alloys thereof, but are preferably both Ru. An interconnect conductive material may include Cu, Al, W or AlCu, preferably Cu.

Platinum Electrode Surface Coating

SECOND SIGHT MED. PROD. INC

World Appl. 2007/050,212

A rough-configuration electrode surface coating and method for its manufacture is claimed, which can be applied to a conductive substrate such as Ru, Rh, Ir, Pd, Pt, Ti, Zr, Nb, Ta, Cr, Mo, W, Mn, Re, Ni, Ag, Au or C. Pure Pt is coated onto the surface by electroplating at a rate faster than would be required to produce shiny Pt, but slower than required to produce Pt black, preferably between $0.05\text{--}1.0 \mu\text{m min}^{-1}$. The coating gives an increase in surface area of 5–500 times *vs.* the original substrate surface, and is biocompatible.

Nitrogenated Hard Bias Layers Containing Platinum

HITACHI GLOB. STORAGE TECHNOL.

U.S. Appl. 2007/0,091,515

A read sensor for a magnetic head includes a sensor stack, hard bias layers and lead layers. The hard bias layers are formed from a nitrogenated Co-based alloy such as nitrogenated CoPtCr or CoPt, by ion beam deposition using a sputtering gas such as Xe with N_2 as a reactive gas. Coercivity and squareness are improved by the nitrogenation. The sensor can be used for a magnetic data storage device.

Platinum-Iron Alloy Plating Solution

CANON INC

Japanese Appl. 2006-265,716

A solution for plating a magnetic head includes ammonium hexachloroplatinate and an Fe component stabilised by a complexing agent such as tartaric or citric acid. The pH is between 6–9.5. An electrode and an object to be plated are positioned in a vessel containing the solution, and voltage is applied to the electrode to effect plating.

Osmium Coating for TEM Samples

SUMIKA CHEM. ANAL. SERV. LTD

Japanese Appl. 2006-329,743

A sample of a material such as a semiconducting material is prepared for transmission electron microscope analysis by coating the surface with a film of Os. A preparatory protective coating of Pt, Pd, PtPd, AuPd or Au may first be applied by vacuum vapour deposition. The prepared sample forms a thin film integrated circuit.

Push Switch with Rhodium Coating

FUJIKURA LTD

Japanese Appl. 2006-351,255

A dome-type push switch includes a dome shaped metal spring made from a thin plate of stainless steel or phosphor bronze with a surface coating of Rh. The good corrosion resistance and high hardness (Vickers hardness $H_v = 800\text{--}1000$) of Rh means that improved corrosion resistance and wear resistance can be obtained even when using a thin layer of Rh.

APPARATUS AND TECHNIQUE

Pirani Pressure Gauge with Platinum Alloy Filament

THE BOC GROUP PLC *European Appl.* 1,771,710

A thermal conductivity pressure gauge includes a heated, coiled sensing filament made from an alloy of Pt and Ir, containing $\geq 70\%$ Pt and preferably $\sim 90\%$ Pt and 10% Ir. The filament is arranged in a non-linear configuration, for example a V-shape, and can be used in a corrosive environment to reliably measure pressures down to 10^{-4} mbar over a prolonged period of time.

Palladium-Based Alloy for Sensor

SHANGHAI RUI SHI INSTRUM. ELECTRON. CO LTD
Chinese Appl. 1,773,211

An ultralow-temperature drift electric eddy-current displacement and vibration sensor is claimed which includes a probe formed from a Pd-based inductive coil, a coaxial connecting cable and a preamplifier. The coil is made from an alloy wire containing (in wt.%): 58.6–65.4 Pd, 13.4–20.2 Ag and 16.6–23.4 Au. A connecting cable includes a core wire with (in wt.%): 36–43 Cu, 10–17 Au and 45–52 Ag.

HETEROGENEOUS CATALYSIS

N₂O Decomposition Catalyst

STICHTING ENERGIE *European Appl.* 1,755,770

A catalyst can be used for decomposition of N₂O in a gas which may also contain NO_x, O₂ and/or H₂O and has < 50 ppm hydrocarbon. A zeolite is first loaded with 0.00001–4 wt.% of a metal selected from Ru, Rh, Os, Ir, Pt, Ag, Re and Au, preferably Ru, Rh, Os or Ir. Then a second metal (0.1–10 wt.%) is loaded, selected from Fe, Co, Ni, V, Cr, Mn or Cu, preferably Fe, Co or Ni.

Synthesis of C₂ Oxygenates from Carbon Monoxide

BP PLC *European Appl.* 1,755,780

A SiO₂-supported catalyst for synthesis of C₂-oxygenates such as EtOH, CH₃CHO and CH₃CO₂H, by hydrogenation of CO has the formula RhMnFeM₁M₂, where M₁ = Li and/or Na, and M₂ = Ru and/or Ir. Rh is 0.1–3 wt.% of total catalyst, and the weight ratios of the other constituents *vs.* Rh are: 0.5–12 Mn, 0.01–0.5 Fe, 0.01–1 M₁ and 0.1–1.0 M₂. The catalyst is prepared from a solution containing compounds of the desired components, which is impregnated onto SiO₂ gel support and then dried at 283–473 K for 2 h–20 days. It may be reduced *in situ* in pure H_{2(g)} or a gas containing H₂, at 573–673 K for ≥ 1 h.

Platinum Group Metal Oxide Sols

JOHNSON MATTHEY PLC *European Appl.* 1,761,335

A sol is formed from nanoparticles of Pt, Pd, Rh, Ir, Ru or Os oxides plus stabiliser ions dispersed in an aqueous liquid. Nanoparticles have average diameter < 10 nm and the molar ratio of metal to stabiliser ions is ≥ 0.7 . The sol can be contacted with a support material in the form of a powder, an aqueous slurry or a solid substrate to form a supported catalyst.

Iridium Catalyst System for Alkane Metathesis

A. S. GOLDMAN *et al.* *U.S. Appl.* 2007/0,060,781

A method of making a liquid hydrocarbon fuel such as gasoline or diesel fuel from synthesis gas produced by Fischer-Tropsch catalysis includes a step of converting low molecular weight alkanes, C_nH_{2n+2} ($n = 3$ –10), to higher molecular weight alkanes, C_mH_{2m+2} ($m = 4$ –40), using a dual catalyst system. This includes a H transfer catalyst, preferably an Ir pincer complex catalyst, and a metathesis catalyst. Both catalysts are heterogeneous and may be immobilised on the same or separate solid supports.

Exhaust Gas Cleaning Catalyst

TOYOTA MOTOR CORP *Japanese Appl.* 2006-297,237

A catalyst for exhaust gas purification is claimed which controls sintering of Pt particles. Pt is supported on a metal oxide carrier containing Mg and Al oxides, where atom ratio of Mg to total Mg and Al is 1/3–4/5, and particle size of MgO is ≤ 20 nm. MgO is supported in a spinel.

Nitric Acid Reduction Catalyst

KOBE STEEL LTD *Japanese Appl.* 2006-314,888

A HNO₃ reduction catalyst composition includes Pt, Cu and Sn and is effective for reduction of NO₃⁻, NO₂⁻, etc. in the presence of H_{2(g)}, including at high HNO₃ concentrations and pH ≤ 2 . The atomic ratio of each constituent is in the range (in at.% *vs.* Pt) 10–50 Cu and 0.5–10 Sn, and the composition may be supported on a solid support.

Hydrogenation Catalyst

DALIAN TECHNOL. UNIV. *Chinese Appl.* 1,775,361

Nanoparticulate hydrogenation catalysts, with diameter 5 nm–500 μ m, are prepared using a chemical displacement process. A salt of a metal N, selected from Ru, Rh, Pd, Pt and Ir or a mixture, is combined with a metal M, selected from Zn, Al, Fe, Co and Ni, then a displacement reaction is carried out to give metal N. When the molar ratio N:M is between 1:10–1:10,000, a catalyst of the type N/M is formed, where N is supported on M. When the molar ratio N:M is between 1:1–1:10, a highly dispersed N colloid catalyst is formed. Addition of a stabilising agent to the colloid gives a supported catalyst of type N/S, where S = C, Al₂O₃, SiO₂, MgO, ZrO₂ or CeO₂.

HOMOGENEOUS CATALYSIS

Continuous Metathesis with Ruthenium Catalysts

BOEHRINGER INGELHEIM INT. *European Appl.* 1,765,497

A continuous process for carrying out a metathesis reaction, such as RCM, in the presence of a Ru catalyst, is claimed. The five-coordinated Ru complex catalyst includes 2 anionic ligands, 2 neutral ligands and 1 carbene ligand which may optionally be linked to one or both of the neutral ligands. Reaction may be carried out in solution on a packed column with a fixed retention time, in a sequence of one or more stirred vessels with a catalyst inactivation region in the final vessel, or in one or more microreactors.

Enantiomers of 3-Hydroxy-3-phenyl-propylamines

BOEHRINGER INGELHEIM PHARMA GmbH

European Appl. 1,765,766

An improved process for industrial preparation of enantiomerically pure 3-hydroxy-3-phenyl-propylamines uses asymmetrical hydrogenation as a key step, with an optional sequence of subsequent steps. The catalyst system consists of Rh and chiral 4-(dicyclohexylphosphino)-2-(diphenylphosphinomethyl)-*N*-methylaminocarbonylpyrrolidine. Reaction is carried out at 0–100°C, 1–150 bar, for 2–48 h and optionally in the presence of a protic diluent such as H₂O and less than 1 equivalent of a weak base. The process can be used in the synthesis of products such as *R*-atomoxetine, *S*-fluoxetine or *S*-norfluoxetine.

ROMP with Fluorinated Groups

D. LAZZARI *et al.*

U.S. Appl. 2007/0,037,940

New metathesis oligomers are claimed which are substituted with fluorinated groups, and can be prepared by ROMP from a polymerisable composition including: a penta- or hexavalent Ru or Os carbene catalyst which contains 2 anionic ligands; 2 or 3 monodentate, neutral electron donor ligands; and an aryl, arylthio or C₃–C₅ alkenyl carbene ligand. The products can be used to increase the oil and water repellence of organic materials.

FUEL CELLS

Ruthenium-Rhodium Alloy Electrode Catalysts

LG CHEM LTD

European Appl. 1,771,903

An electrode catalyst for a MEA is made from a RuRh alloy, where each element is present in 10–90 mol%. Supports may include porous C, conductive polymers or metal oxides. The catalyst has good O₂ reduction activity and MeOH resistance and can be used for a cathode in PEMFC, DMFC, etc.

Platinum-Containing Electrocatalysts

HONDA MOTOR CO LTD

World Appl. 2007/024,489

Compositions formed from alloys of Pt and W with one of Ni or Zr can be used as a thin film electrocatalyst in a fuel cell assembly. A first composition contains (in at.%): 20–45 Pt, 30–70 W and 5–25 Ni; preferably 20–40 Pt, 35–55 W and 15–25 Ni. A second composition contains (in at.%): 20–45 Pt, 30–70 W and 5–40 Zr; preferably 30–40 Pt, 30–45 W and 15–35 Zr.

Hydrogen Purification Membranes

D. J. EDLUND *et al.*

U.S. Patent 7,195,663

A steam-reforming fuel processor for production of substantially pure H_{2(g)} from a C-containing feedstock plus H₂O includes a steam-reforming catalyst and a H₂ separation assembly. At least one H₂ selective membrane is included, made from Pd or a Pd alloy such as PdCu, which may further incorporate ~ 5–250 ppm C, preferably < 100 ppm C. The fuel processor as claimed may be used in combination with a fuel cell stack adapted to receive the product H_{2(g)} stream.

Gold-Platinum Alloy Nanoparticles

C.-J. ZHONG *et al.*

U.S. Patent 7,208,439

C-supported AuPt nanoparticle alloy catalysts for fuel cells, especially those using MeOH as fuel, are claimed. The Au:Pt ratio can be controlled in the range 1:99–99:1, and is preferably between 50:50–80:20. Supports may include C black or C/TiO₂. Bifunctional electrocatalytic activity is demonstrated towards CO and MeOH oxidation and O₂ reduction. Both anodes and cathodes may be prepared from the same catalyst material.

Production of Fuel Gas

IDEMITSU KOSAN CO LTD

Japanese Appl. 2006-286,552

Fuel gas for SOFCs to be operated in mid- and low-temperature ranges can be produced using a reforming catalyst containing at least one of Ru, Pt, Rh, Pd and Ir, preferably Ru, on a support selected from MnO and CeO₂, which may further incorporate Al₂O₃. Reforming processes may include partial oxidation, self-thermal reforming, steam reforming or CO_{2(g)} reforming.

Membrane Electrode Assembly

SAMSUNG SDI CO LTD

Korean Appl. 2006-0,108,108

A MEA for a PEMFC includes an anode and a cathode facing one another, with a PEM between, and can be applied to a high-temperature type polybenzimidazole-based polymer. At least one of the electrodes includes an electrode base having a sheet-like catalyst layer of thickness 10–100 μm, which contains a catalyst selected from Pt, Ru, Os, PtRu, PtOs, PtPd or PtM (where M = Ga, Ti, V, Cr, Mn, Fe, Co, Ni, Cu or Zn).

MEDICAL USES

Demethylcantharidin Platinum Complex Isomers

CHINESE UNIV. HONG KONG

European Appl. 1,749,831

Stereoisomers of the demethylcantharidin Pt complex are claimed to inhibit growth of cisplatin, carboplatin or oxaliplatin-sensitive or -resistant tumour cells. Isomers may include a *cis*-isomer, a *trans-S,S*(+)-isomer, a *trans-R,R*(-)-isomer or a *trans*-racemate and may be incorporated into a pharmaceutical composition with a carrier.

Ruthenium Complexes for Treating Cancers

UNIV. LOUIS PASTEUR

European Appl. 1,776,103

Novel Ru complexes are claimed which can be used for the treatment of various cancers, including cisplatin-resistant cancers, separately or in combination with other treatments. The claimed structures may include 1 or 4 of either halogens or electron-donating ligands containing N, O, P or S, plus a metallocycle of 5–8 atoms coordinated *via* N.

Impeller for Rotary Ventricular Assist Device

C. R. SHAMBAUGH *et al.*

U.S. Appl. 2007/0,078,293

An impeller for an implantable blood pump is made from a magnetic alloy containing 70–80 wt.% Pt and 20–30 wt.% Co. The alloy may be heat-treated to improve its magnetic properties.