

# NEW PATENTS

## METALS AND ALLOYS

### Metal Alloy Compositions for Jewellery

HARRY WINSTON INC. *World Appl.* 00/22,180

Metal alloy compositions used in the manufacture of jewellery have a white finish consisting of (by wt.%): 95 Pt, 2.5–3.5 Rh and 1.5–2.5 Ru. The alloy exhibits enhanced whiteness in comparison to Pt alloys available in the art. It does not require Rh plating to achieve an acceptable whiteness, thus increasing the ease of making the alloy, and reducing the cost of jewellery casts and settings.

### Alloy for Jewellery

IJIMA KIKINZOKU SEIREN K.K.

*Japanese Appl.* 2000/080,423

Au alloy for jewellery, such as rings, includes (by wt.%): 75–75.5 Au, 4–18 Pt, 2–11 Pd and 2–11 Ag. The alloy excels in workability and hardness. The corrosion resistance and antiwear quality are good.

## ELECTROCHEMISTRY

### Assembly for Separating Normal Water

K. R. OZCELIK

*World Appl.* 00/23,638

An internal combustion assembly for separating normal H<sub>2</sub>O into H<sub>2</sub> and O<sub>2</sub>, and starting a combustion reaction, has a second winding that is added to an alternator, and is provided with an anode of cylindrical structure made of Pt wires and a cathode made of compressed C powders. The level of H<sub>2</sub>O in the electrolysis container is controlled by a circuit. Maximum efficiency is obtained and the amount of gases passed into the atmosphere is minimised.

### Wastewater Treatment

KYUNGWON ENTERPRISE CO. LTD.

*World Appl.* 00/27,758

An electrode for treating wastewater comprises a substrate coated with a multi-element electrode catalyst comprises at least RuO<sub>2</sub> and SnO<sub>2</sub>. The electrode is cheap and durable, and has high O<sub>2</sub> overvoltage, and can thus treat wastewater more effectively. The electrode catalyst may be a three-element catalyst composed of the oxides of Sn-Pt-Ru, and the novel substrate is a ceramic Ti407.

### Chlorine Production

E. I. DU PONT DE NEMOURS & CO. *U.S. Patent* 6,066,248

Chlorine is produced by electrolysis of an aqueous solution of HCl in an electrochemical flow reactor consisting of a solid polymer electrolyte membrane; an anode comprised of an ionomer and a catalyst material selected from Pt, Ru, Os, Rh, Ir, Pd, Re, Au, Ti, Zr, and their oxides, alloys and mixtures; and a cathode. The anode and cathode may be on the membrane. HCl solution is fed to the anode. Electrolysis using high current densities and low cell voltages, minimises side reactions, such as O<sub>2</sub> generation.

## ELECTRODEPOSITION AND SURFACE COATINGS

### Electroless Palladium Plating Liquid

HITACHI CHEM. CO. LTD. *Japanese Appl.* 2000/129,454

Electroless Pd plating solution consists of a complexing agent for Pd ions, with tetra-ammine Pd compounds as the Pd ion source, a reducing agent such as formate, and a pH regulator. The plating velocity of Pd with this plating solution is excellent.

## APPARATUS AND TECHNIQUE

### Nitrogen Oxide-Decomposing Electrode

NGK INSULATORS LTD.

*European Appl.* 1,006,352

A NO<sub>x</sub>-decomposing electrode has a cermet electrode composed of a Pt-Rh alloy (weight ratio of Pt:Rh = 20:80–1:99) and a ceramic component. The apparatus measures NO<sub>x</sub> concentration in atmospheric air and exhaust gas discharged from vehicles, and may also contain an O<sub>2</sub> pump to control the O<sub>2</sub> concentration. Oxidation and reduction of Rh are effectively suppressed, which allows suppression of NO<sub>x</sub> adsorption at low temperature.

### Catalytic Gas Detector

EIC LAB. INC.

*U.S. Patent* 6,060,025

A catalytic gas detector for measuring the concentration of organic gases in air comprises a combustion sensor including a pellistor with a noble metal catalyst, which detects the gas concentration; a source of non-oxidising hydrocarbon-containing gas (1) coupled to the combustion sensor; and a controller coupled to the sensor. The detector operates in detection and regeneration modes. *In situ* catalyst regeneration occurs by heating in the presence of (1).

### Solar Energy Devices

STARFIRE ELECTRONIC DEV. & MKTG. LTD.

*U.S. Patent* 6,060,026

A photoelectrochemical device (1) comprises a Si domain, with a specified quantum excitation energy band gap to induce reaction, in electrical contact with a first catalytic material, of Os, Ir or Ru, their oxides, chalcogenides, etc. (1) uses solar energy to drive electrochemical reactions, to react a molecule using light as an energy source and catalyst material, to decompose H<sub>2</sub>O, and to degrade pollutants. (1) has good stability in corrosive solutions.

### Resistor Slide Sensor

TOYOTA JIDOSHA K.K.

*Japanese Appl.* 2000/111,309

A resistor slide-type rotation angle sensor for a potentiometer, has slider units (1) formed with Pd-Ag alloy, ≤ 18 wt.% each, in contact with resistors. (1) has comb tooth in a point. The cross-section of (1) has a groove of parabolic shape so that abrasive powder falls easily into the groove. The quantity of abrasive powder remaining on a resistor is reduced.

## HETEROGENEOUS CATALYSIS

### Nitrogen Oxide-Storage Catalyst

DEGUSSA-HUELS A.G. *World Appl.* 993,860

A NO<sub>x</sub>-storage catalyst used in exhaust gas purification from lean burning automobiles has at least one fine particled catalyst, such as Pt or Rh on active Al<sub>2</sub>O<sub>3</sub>, CeO<sub>2</sub> and/or ZrO<sub>2</sub>, and a NO<sub>x</sub>-storage component, with particle diameter of < 1 μm of Ba and/or Sr sulfates or their mixture. The catalyst has improved ageing stability and can be coated on the walls of the flow canals of inert honeycombs.

### Emission Control for Diesel Engine Exhaust

JOHNSON MATTHEY PLC *World Appl.* 00/21,647

A method for controlling emissions from diesel engine exhaust, comprises a catalyst to convert NO to NO<sub>2</sub>, a filter to trap soot and hold it for combustion with the NO<sub>2</sub>, and a NO<sub>x</sub> absorber (1). The catalyst, which is associated with or follows (1), contains Pt group metal(s) supported on V<sub>2</sub>O<sub>5</sub>/TiO<sub>2</sub>. (1) can be regenerated by decreasing the net oxidant level and injecting a NO<sub>x</sub>-reductant upstream. During regeneration, the exhaust gases leaving the absorber are passed through a three-way catalyst. The process meets the European Stage IV emission legislation.

### Catalytic Composition for Unsaturated Hydrocarbons

PHILLIPS PETROLEUM CO. *World Appl.* 00/23,403

A catalyst composition (1) for use in the selective hydrogenation of an unsaturated hydrocarbon, such as alkynes or diolefins, comprises Pd, an inorganic support, and a selectivity enhancer comprising P, a P compound, S and/or a S compound. In the presence of (1) and H<sub>2</sub>, highly unsaturated hydrocarbons are converted to less unsaturated hydrocarbons. Using (1) decreases production of the oligomers that form green oils which decrease the life cycle of (1).

### Exhaust Gas Purification

TOYOTA JIDOSHA K.K. *World Appl.* 00/27,508

Exhaust gas purification of hydrocarbons, CO and NO<sub>x</sub> from I.C.E. is performed by contacting low hydrocarbon-containing exhaust gas with an oxidation-reduction catalyst which comprises Rh and/or Pd supported on an O<sub>2</sub> occluding and releasing material. The emission of hydrocarbon is greatly inhibited over a wide range from low temperature to high temperature. The activity of the catalyst is improved.

### Reforming Naphtha Feedstock

UOP LLC *U.S. Patent* 6,048,449

A naphtha feedstock is contacted with a dual function catalyst (1) comprising a refractory inorganic oxide support combined with a multigradient metal component containing (in mass %): 0.01–2 Pt group metal, 0.1–5 In, 0.01–5 Group IVA metal and 0.1–10 halogen, at 425–565°C and 350–2500 kPa. The concentration of the Pt group metal in the surface layer of (1) is ≥ 5 times higher than in the central core. (1) has improved activity, stability and selectivity, and an improved gasoline yield is obtained.

### Selective Hydrogenation of Benzene

CHINESE PETROLEUM CORP. *U.S. Patent* 6,060,423

A catalyst (1) for the selective hydrogenation of benzene to cyclohexene (2) comprises a Group VIII metal, preferably Ru, supported on a binary Ga-Zn oxide, in which the atomic ratio of Ga:Zn is 1:1–5. (1) gives a high selectivity and yield in the production of (2), and allows mass production of (2). (2) is useful as a starting material for the manufacture of pharmaceuticals, foods, agrochemicals, animal feeds and nylon 66 (via adipic acid).

### Catalytic Reforming of Hydrocarbons

CHEVRON CHEM. CO. LLC *U.S. Patent* 6,063,264

Catalytic reforming of feed hydrocarbons into aromatics involves contacting the feed under catalytic reforming conditions with catalyst disposed in the tubes of a furnace. The catalyst is monofunctional and non-acidic, comprising a Group VIII metal (Pt) and zeolite L. The furnace tubes have an inside diameter of 2–8 inches and are heated by gas or oil burners located outside the tubes. The process is simplified and requires significantly less capital equipment than conventional catalytic reforming systems.

### Sulfur-Tolerant Pt/L-Zeolite Catalyst

UNIV. OKLAHOMA STATE *U.S. Patent* 6,063,724

S-tolerant Pt/L-zeolite catalyst (1) is prepared by modifying substantially anhydrous L-zeolite with rare earth ion(s), calcining the latter, and then associating a Group VIII metal with the modified L-zeolite. (1) is used for the conversion of (cyclo)aliphatic hydrocarbons, and for reforming, dehydrogenating, and aromatising aliphatic and/or cycloaliphatic hydrocarbons. The increase in S tolerance results in increased conversion and selectivities.

### Monolithic Catalyst for Purification of Exhaust Gas

NISSAN MOTOR CO. LTD. *Japanese Appl.* 2000/093,799

A monolithic catalyst (1) for the purification of exhaust gas emitted from I.C.E. has a bed supporting catalytic constituents, and contains Pd and aluminate powders of formula (X)<sub>a</sub>(Y)<sub>b</sub>Al<sub>c</sub>O<sub>d</sub> where X = Co, Ni and/or Zn; Y = Ce and/or Zr; a, b, c and d = atomic ratios; when c = 2.0, a = 0.1–0.8, b = 0.001–0.3, and d = number of O atoms to satisfy the valence of each constituent. (1) can also contain La, Nd and Zr, and CeO<sub>2</sub>. (1) has low temperature activity and catalytic activity in any exhaust gas atmosphere.

### Exhaust Gas Purifier

ZEXEL K.K. *Japanese Appl.* 2000/104,540

An exhaust gas purifier for I.C.E. has a microwave absorber comprising Pt, Rh, Pd as catalyst material which is configured in a cavity resonator and adjusts impedance to set reflecting electric power ratio to ≥ 10 dB. A honeycomb-like metal is configured beside the microwave absorber and cavity resonator and made to conduct electrically via the casing. Microwaves are absorbed effectively, so the catalyst can quickly reach its operating temperature.

## Palladium-Carrying Zeolites

NIPPON OIL CO. LTD. *Japanese Appl.* 2000/126,602

Production of Pd-carrying zeolite casting catalyst (1), where the zeolite is preferably mordenite, involves making zeolite pellets, with binder, to carry Pd and performing rapid drying with hot air, after preprocessing in aqueous  $\text{NH}_3$ . (1) is used for conversion reactions of hydrocarbons, such as hydrogenation, isomerisation and disproportionation. The Pd load can be dispersed with high uniformity between pellets and within each pellet. (1) has long life and high activity in the above reactions.

## Destruction of Organochlorine Pollutants in Water

ATE ANTIPOLLUTION TECH. ENTREPRISE

*French Appl.* 2,784,981

A process for destroying chlorinated pollutants in a phreatic (pollutant-saturated)  $\text{H}_2\text{O}$  layer comprises contacting the  $\text{H}_2\text{O}$  layer with a catalyst comprising Pd supported on a synthetic or natural zeolite. The process is useful for treating water contaminated with chlorinated solvents, such as trichloroethylene, chlorinated aromatic compounds, such as chlorobenzene, and/or plant protection agents, such as Lindane or Dinoterbe. A wide range of organic pollutants can be degraded by changing the hydrophobicity of the zeolite supports by selecting a suitable Al:Si ratio.

## Hydrogenation of Aromatic Amines

BAYER A.G.

*German Appl.* 1/98/45,641

A process for the hydrogenation of aromatic amines to symmetrical dicycloaliphatic amines proceeds with high selectivity and high conversion at 0.5-50 bar on base-treated, supported Pt group metal catalysts. The support is coated with salts or oxides of Cr, Mo, W, Mn and/or Re, impregnated with Rh and optionally with Ir, Ru, Os, Pd and/or Pt, then treated with base. The base is completely or partly neutralised by final impregnation with a soluble acid.

## HOMOGENEOUS CATALYSIS

### High Purity Organopolysiloxanes

DOW CORNING CORP.

*European Appl.* 995,771

High purity oxyalkylene-modified organopolysiloxanes useful in cosmetics are prepared by reacting vinyloxy polyoxyalkylene compound and organohydrogensiloxane compound in the presence of a Pt group metal-containing catalyst (1). The organopolysiloxanes are free of unwanted odour and do not contain excess polyoxyalkylene compound since the vinyloxy polyoxyalkylene compounds are not prone to isomerisation during the reaction.

### Production of Isobutylene Glycol

MITSUBISHI GAS CHEM. CO. INC. *European Appl.* 1,010,682

Isobutylene glycol (1) is produced by the reduction of methyl hydroxyisobutyrate using a catalyst comprising Cu and/or Ru components. The catalyst is more selective than prior art and produces (1) in higher yields. (1) is useful as a raw material in the production of polyester films, resins and solvents, etc.

## Methanol Carbonylation

ACETEX CHIM. S.A.

*World Appl.* 00/27,785

The addition of Pt to the Ir- or Ir/Rh-based catalytic system for the production of acetic acid and/or methyl acetate by the carbonylation of methanol and isomerisation of methyl formate, results in an improved, continuous, liquid phase. The reaction is performed in the presence of  $\text{H}_2\text{O}$ , a solvent, the homogeneous catalyst system, a halogenated promoter and CO. Improved productivity is obtained.

## Hydroformylation of Olefins

SHELL OIL CO.

*U.S. Patent* 6,037,506

A hydroformylation process for converting olefins to aldehydes and alcohols uses a combination of a source of Pd, Pt or Ni; a bidentate ligand; and an acid promoter. An olefinic feed is reacted with  $\text{H}_2$  and CO in a catalyst system of Pd, diphosphine ligand,  $\text{H}_2\text{O}$  and a promoter such as formate, formic acid or a formic acid forming reagent that is not an orthoformate. The process does not damage or destroy the reactors or vessels and results in high conversion/high selectivity reactions with excellent reaction rates.

## FUEL CELLS

### Carbon Monoxide Oxidation Catalyst

IDEIMITSU KOSAN CO. LTD.

*World Appl.* 00/30,745

A CO oxidation catalyst, useful in the production of  $\text{H}_2$ -containing gas, comprises Ru and optionally alkali metal and/or alkaline earth metal supported on  $\text{TiO}_2$  and  $\text{Al}_2\text{O}_3$ . CO poisoning of the Pt/ $\text{H}_2$  electrode of a  $\text{H}_2$ - $\text{O}_2$  fuel cell is prevented. The CO in the  $\text{H}_2$ -containing gas is selectively removed over a broad temperature range. The lifetime of the cell and the stability of the discharge are improved.

### Improving Fuel Cell Performance

BALLARD POWER SYSTEMS INC.

*World Appl.* 00/24,072-3

The performance of a liquid feed SPEFC is improved by impregnating the electrode substrate with a first proton conducting ionomer, then applying the electrocatalyst such as Pt-Ru (1) to the impregnated substrate, or by oxidising the carbonaceous substrate prior to incorporation of (1). The electrode is supplied with a liquid reactant stream. The ionomer coating reduces the tendency of (1) to penetrate the substrate and keeps (1) localised at the substrate/membrane interface in the MEA. Better transport of reactants and products is achieved.

### Solid Polymer Electrolyte Membranes

JOHNSON MATTHEY PLC

*World Appl.* 00/24,074

The preparation of a solid polymer electrolyte membrane, comprised of an ion-conducting polymer, a precious metals catalyst, such as Pt, and a high surface area support, is claimed. Also disclosed is the preparation of a membrane electrode assembly and a fuel cell. The process is less complex, has fewer and shorter steps, with consistent results. Lower amounts of catalyst are used more effectively.

## Nanocrystalline Particles for Fuel Cell Electrodes

FARADAY TECHNOLOGY INC. *World Appl.* 00/28,114

Nanocrystalline particles (3–8 nm) of Pt, Pd, Ru and/or Rh or their alloys (1), are electrodeposited on a substrate by immersing an electrically conductive substrate and a counter electrode in an electroplating bath; then passing a pulsed electric current. The catalyst layer is 0.1–15  $\mu\text{m}$  thick and the catalyst loading is 0.1–1.0  $\text{mg cm}^{-2}$ . Due to the contact of (1) with the solid electrolyte and the electroconductive support, effective catalysis of the fuel cell reactions is assured.

## Solid Oxide Fuel Cell

INT. BUSINESS MACHINES CORP.

*U.S. Patents* 6,051,173 and 6,051,329

A SOFC (1) with controlled porosity is produced by forming anode, electrolyte, cathode and interconnect layers from laminated materials. The layers comprise unsintered ceramic material with Pt, Rh and/or Ru catalyst. The laminate is then sintered in a neutral or reducing atmosphere. (1) generates electricity from fuel gas and air. The catalytic anode has a low operating temperature and high efficiency in reforming fuels without carbonaceous residues.

## Solid Polymeric Type Fuel Battery

TOSHIBA K.K.

*Japanese Appl.* 2000/133,283

A solid polymeric type fuel battery for space vehicle use has gas diffusion electrodes on both sides of a solid polymer electrolytic film. Catalyst layers of Pt or Ru are coated on the electrode surface which contacts the surface of the electrolytic film. The contact area of the electrode and the film is set to  $\geq 0.005 \text{ m}^2 \text{ cm}^{-2}$  of electrode.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### Metallised Ceramic Magnetic Device

LUCENT TECHNOLOGIES INC. *European Appl.* 1,017,068

A metallised ceramic magnetic substrate device (1) is produced by coating an unfired ferrite substrate with conductive material of Ag/Pd and 10–50 wt.% ferrite particles, cellulose or other organic binder and solvent, firing the substrate, and electroplating Cu onto the conductive material via a Cu pyrophosphate bath. High pull strengths are obtained due to the improved conductive coating. (1) is used to produce inductors, transformers and magnetic substrates.

### Cathode Material for Electron Emission

NIKOS-ECO LTD.

*World Appl.* 00/21,110

A cathode material (1) for emitting electrons in electron beam devices and cathode-ray tubes, includes in wt.%, 0.5–9.0 of a rare earth metal of the cerium group, 0.5–15 W and/or Re, 0.5–10 Hf and remainder Ir. (1) is prepared by melting Ir and Ce to form  $\text{Ir}_5\text{Ce}$ , melting Hf and W to form  $\text{Hf}_3\text{W}$  and finally melting the formed  $\text{Ir}_5\text{Ce}$  and  $\text{Hf}_3\text{W}$  to prepare an ingot of (1). (1) has excellent electron-emissive and mechanical properties and longer useful life.

## Organic Electronic Package

INT. BUSINESS MACHINES CORP.

*U.S. Patent* 6,025,057

An electronic package for chip carriers, printed circuit boards and cards, accessory cards, etc., consists of an organic substrate, with a first conductive circuit. On top of this is stacked a photoimageable dielectric, an organic polyelectrolyte, a Pd-Sn seed layer (of Pd coverage  $< 8 \mu\text{g cm}^{-2}$  and Sn coverage  $< 2 \mu\text{g cm}^{-2}$ ), and a second conductive circuit. The polyelectrolyte is catalytic for forming the Pd-Sn seed layer which is catalytic for Cu deposition.

## Sputtering Material for Thin Film

FURUYA KINZOKU K.K.

*Japanese Appl.* 2000/109,943

A sputtering material for thin film formation, useful for optical recording media, contains Ag-Pd alloy (1) having 0.5–4.9 % of Ag and Pd. (1) provides a high reflecting rate and improves the weather resistance of the optical recording medium. The deterioration of the reproduced signal is prevented for a long term. The thin film formed using the sputtering target produces the reflecting rate  $\geq 88\%$  at wavelength  $< 800 \text{ nm}$ .

## Strontium Ruthenate Sintered Compact

KYOCERA CORP.

*Japanese Appl.* 2000/128,638

A Sr ruthenate sintered compact (1) for use as a sputtering target for forming dielectric films has specific density  $\geq 3.5 \text{ g cm}^{-3}$ , and contains molar ratio of Sr:Ru of 1.1–1.3. (1) is made by the calcination of  $\text{SrCO}_3$  and  $\text{RuO}_2$  to form a Sr-Ru calcined powder, which is moulded to a specific shape and baked to form (1). Dielectric film is formed when high density (1) is used as the sputtering target.

## Spin Valve Magneto-Resistive Head

YAMAHA CORP.

*Japanese Appl.* 2000/132,820

A spin valve magneto-resistive head includes a magnetic fixing layer containing an antiferromagnetic film (1) made of a Pt-Mn alloy, or Pt and Mn, having the film thickness set to 20–35 nm. A spacer-layer magnetic film and a magnetic fixing layer containing the rigid Pt-Mn antiferromagnetic film are sequentially formed on a soft magnetic freedom layer. Loss of sensitivity at high temperature is prevented.

## MEDICAL USES

### Passage Opening Medical Stent

W. C. HERAEUS G.m.b.H. & CO. K.G.

*German Appl.* 1/99/06,417

A passage opening support structure, especially a medical stent, has a Au layer between a special steel substrate and a Pt surface layer (1) of thickness 0.1–1.0  $\mu\text{m}$ . (1) provides the required biocompatibility while the Au layer withstands mechanical loads, especially bending and torsion forces during stent widening, to avoid crack formation in the Pt layer.

The New Patents abstracts have been prepared from material published by Derwent Information Limited.