

NEW PATENTS

CHEMICAL COMPOUNDS

Polymeric Transition Metal Complexes

THERASENSE INC *U.S. Patent 6,605,200*

A novel polymeric metal complex with Os, Ru, Fe, etc., has a polymeric backbone; a plurality of spacers, each being covalently coupled to and extending from the polymeric backbone and including a non-cyclic functional group; and a plurality of transition metal complexes. These redox polymers can carry electrons between an enzyme and an electrode in a sensor.

APPARATUS AND TECHNIQUE

Polymer Gel Hybrid Solar Cells

SONY INT. (EUROPE) GmbH *World Appl. 03/054,894*

A polymer gel hybrid solar cell (1) includes a back-electrode; a polymer gel electrolyte of nanoparticles (2–25 nm) and redox couple; and Ru dye sensitised porous TiO₂. (1) can reach a light-to-energy conversion efficiency of $\leq 9.2\%$ with 100 mW cm^{-2} , and $\leq 14.1\%$ with reduced light intensity of 33 mW cm^{-2} .

Oxygen Sensor

KYOCERA CORP *U.S. Appl. 2003/0,146,093*

An O₂ sensor (1) contains a sensing element comprising a solid ZrO₂ electrolytic substrate shaped as an elongated plate, and a Pt measuring electrode (2) and a Pt reference electrode formed on the ends of the opposing surfaces. (2) has an area of 8–18 mm², and the sensing element is 2.0–3.5 mm wide at the end of the substrate. (1) has excellent gas response performance, can be quickly heated and is small in size.

Electrochemiluminescence in Detecting Analytes

ROCHE DIAGNOSTICS GmbH *U.S. Patent 6,599,473*

Liquid test samples are analysed by electrochemiluminescence (EL) using a specific biochemical binding reaction to form a complex which contains a chemiluminescence marker. The complex is bound to a magnetic microparticle. Potential is applied to a Pt working electrode in a measuring cell to trigger the EL reaction. The light emitted by the marking substance is measured to determine the concentration of the marked microparticle.

Combustible Gas Sensor

NATL. INST. ADV. IND. TECHNOL.

Japanese Appl. 2003/083,929

A combustible gas (especially a hydrocarbon-based gas) sensor has a Pt and a Au electrode formed in parallel on the same face of a solid electrolyte body with proton conductivity, held at 250–450°C in contact with an atmosphere to be measured. When gas is present, a potential difference is generated across the electrodes, and its value is a measure of the gas concentration. Combustible gas, excluding H, CO and NO, can be detected with satisfactory sensitivity without being dependent on steam.

Organic Electroluminescence Device

NIPPON HOSO KYOKAI *Japanese Appl. 2003/086,376*

An organic electroluminescence device with a high luminous efficiency contains an organic, luminous layer, which has an organic phosphorescent content formed by mixing two kinds of Ir complexes. The organic layer is laminated on a transparent glass substrate and coated with a transparent electrode and a metal electrode, for instance of Mg. The Ir complexes become the centre of the emission and give phosphorescence over the visible region.

Light Emission Measuring Device

KIKKOMAN CORP *Japanese Appl. 2003/088,398*

A small and lightweight device for measuring the contamination of a specimen by light emission comprises a chamber, a low sensitive light-receiving IrGaAs photodiode (1), etc., for receiving light emitted from an examination tool and a processor to process signals from (1). The contaminant in the specimen is made to emit light with a luminescent reagent containing an adenosine triphosphate-reproducing enzyme such as pyruvate phosphate dikinase. The emission is measured with (1).

HETEROGENEOUS CATALYSIS

Catalytic Autothermal Steam Reforming

OMG AG & CO KG *European Appl. 1,314,688*

Catalytic autothermal steam reforming of alcohols with $\geq 2\text{C}$ atoms, involves directing an educt mixture of the alcohols, O₂ and H₂O or steam, heated to a preheat temperature, over a Pt group metal catalyst supported on Al₂O₃, SiO₂, TiO₂ or their mixed oxides and zeolites, for example, 1 g l^{-1} Rh/honeycomb carrier. The process proceeds in an adiabatic manner. The educt mixture can also contain hydrocarbons reformed simultaneously with the alcohols.

Preparation of Supported Catalysts

BASF AG *European Appl. 1,328,344*

A supported catalyst (1) is obtained by controlled electroless deposition of a Pt group metal from a solution containing: (a) a homogeneously dissolved compound of Pt group metal(s); (b) a reducing agent; and (c) at least one collagen selected from isopoly acids and heteropoly acids of Nb, Ta, Mo, W and V or their salts. (1) is used to hydrogenate inorganic or organic compounds, especially for synthesis of H₂O₂.

Hydrocarbon Synthesis in a Three-Phase Reactor

INST. FRANCAIS DU PETROLE *World Appl. 03/044,126*

Hydrocarbons are synthesised from a mixture comprising CO and H₂, and optionally CO₂, in the presence of a supported catalyst (1) containing at least one Group VIII metal, such as Ru. The support comprises ZrO₂ or a mixed ZrO₂-Al₂O₃, the ZrO₂ being in quadratic and/or amorphous form. (1) is used in the liquid phase in a three-phase reactor.

Microspheroidal Palladium-Gold Catalysts

BP CHEMICALS LTD *World Appl.* 03/061,829

A catalyst active for the fluid bed acetoxylation of ethylene to produce vinyl acetate is prepared by impregnating microspheroidal catalyst support particles of SiO₂, Al₂O₃, ZrO₂ or their mixtures, with an aqueous solution of Pd and Au compounds, by the incipient wetness technique, while agitating the support particles. The Pd compound is an acetate, sulfate, nitrate, chloride, or contains halogen; and the Au compound is a chloride, dimethyl Au acetate, etc.; both may include their Group I and II salts. The impregnated support particles are then dried.

Treatment of Industrial Organic Pollutants

CNRS *World Appl.* 03/064,333

Industrial effluent containing organic pollutants is treated by ozonation in a reactor in the presence of a Ru and/or Ir catalyst supported on CeO₂, ZrO₂, TiO₂ or their mixtures. The catalyst is made from powder particles 20–500 µm in size, maintained in suspension. The effluent treated with the ozone and the catalyst are continuously fed through a separation system to separate the catalyst; the part of the effluent free of catalyst is removed while the remainder is recycled with the catalyst back into the reactor.

Treating Diesel Exhaust Gases

FORD GLOBAL TECHNOL. INC *U.S. Appl.* 2003/0,140,620

A diesel exhaust treatment system and a method to oxidise NO to NO₂ at low temperatures uses a first catalyst of Pt/ZrO₂-stabilised SiO₂ (1), pretreated at 500–650°C in a NO-O₂-N₂ mixture. A sufficient amount of NO₂ is used to oxidise particulate matter trapped on a particulate filter. (1) can also include TiO₂, P₂O₅, WO₃, etc., or a heteropolyacid to increase activity or decrease the Pt loading. A second catalyst for selective reduction is downstream of the filter.

Deeply Reduced Oxidation Catalyst

MONSANTO TECHNOLOGY LLC *U.S. Patent* 6,603,039

N-(Phosphonomethyl)glycerine is formed by contacting *N*-(phosphonomethyl)iminodiacetic acid or its salt with an oxidation catalyst (1) in a solution or slurry of pH < 7, under O₂. (1) increases the oxidation of formaldehyde and formic acid byproducts into CO₂ and H₂O. (1) comprises 0.5–20% of Pt, Pd, Ru, Rh, Ir, Os, Ag and/or Au, and a promoter of 0.5–10% of Bi, Pb, Sn, etc., supported on C. (1) improves resistance to noble metal leaching, and is used in liquid phase oxidation reactions, especially in an acidic oxidative environment or in those that solubilise noble metals.

Platinum in Carbon Fibre Dehydrogenation Catalyst

TOYOTA MOTOR CORP *Japanese Appl.* 2003/088,756

Pressurised CO₂ is pumped into a pressure resistant container holding activated C fibre and Pt acetylacetonate (1) dissolved in auxiliary solvent. On heating, CO₂ becomes supercritical and dissolves (1) which diffuses into the pores of the C fibre. This improves the catalyst efficiency to remove H from a hydride.

HOMOGENEOUS CATALYSIS

Manufacture of Trimethylhydroquinone Diacylates

ROCHE VITAMINS AG *World Appl.* 03/051,812

A 2,3,5-trimethylhydroquinone diacylate (1) is produced by reacting ketoisophorone with an acylating agent, such as an acid anhydride, etc., in the presence of a NH- or CH-acidic catalyst, such as bis(perfluorinated hydrocarbyl sulfonyl) imides and Rh, Pd, Pt, B, Mg, Al, etc., salts; and tris(perfluoroalkanesulfonyl or pentafluorobenzenesulfonyl) methanes and metal salts. (1) can be converted into (all-*rac*)- α -tocopherol, the most active vitamin E, by transesterification.

Surfactant Compounds from Polyols

CNRS *World Appl.* 03/053,987

Surfactant compounds (1) are produced by reacting a pentose with an alkadiene in the presence of a Pd catalyst activated by a phosphine in the presence of a tertiary amine. The reaction can be carried out in aqueous medium or in a polar organic solvent. (1) obtained in aqueous medium mostly contain pentose mono(alkadienyl) ethers, whereas in organic medium (1) mostly contain pentose di(alkadienyl) ethers.

Osmium-Assisted Oxidative Cleavage of Olefins

MICHIGAN STATE UNIV. *U.S. Appl.* 2003/0,149,299

Oxidative cleavage of oxidisable organic compounds is performed using an OsO₄, OsCl₃ or K₂OsO₄·2H₂O catalyst, and a peroxy compound such as peroxy-monosulfuric acid and its salts. Selective production of aldehydes, carboxylic acids, esters, or ketones from the corresponding mono-, 1,1-di-, 1,2-di-, tri- or tetra-substituted olefins proceeds with fewer problems than with the ozonolysis method. Aldehydes can be oxidised alone or with the Os in an interactive solvent to produce an ester or a carboxylic acid.

Cationic Ruthenium and Osmium Complexes

STUDIENGESELLSCHAFT KOHLE mbH

U.S. Patent 6,590,048

Highly active cationic vinylidene, allenylidene and higher cumulenyldene complexes of Ru or Os are prepared and used as catalysts (1) or catalyst precursors (2) for olefin metathesis reactions. (1) and (2) are stable and exhibit high catalytic activity and good compatibility with functional groups, solvents, H₂O and additives, without need for further activation. Olefins of all types can be used as the substrates in RCM of acyclic dienes and polyenes, the metathesis of enynes and dienynes, ROMP of cyclic olefins, etc.

Producing Ketals and/or Acetals

MITSUBISHI CHEM. CORP *Japanese Appl.* 2003/081,901

A ketal and/or an acetal (1) are produced by oxidising olefins, containing ethylenic double bond(s), with O₂ and an alcohol in the presence of a Pd catalyst. After recovering the reaction products, an alcohol solution containing the catalyst is reused, while maintaining the moisture content ≤ 20 wt.%. (1) are produced in high selectivity, and deposition of a catalyst component when olefins are oxidised with O₂ is suppressed.

FUEL CELLS

Thermal Regulating Catalyst Composition

PLUG POWER INC *U.S. Appl. 2003/0,144,133*

A thermal regulating composition used as a catalyst system in a fuel processor for a fuel cell includes Pt, Pd, Rh, Ru, Ir, Cu, Ni, Fe, Cr, Zn or Co, as a catalyst, and a zeolite, SiO₂, Al₂O₃ or a clay, as a desiccant (1). (1) can sorb and desorb a heat transfer material, such as water, so as to remove part of the heat generated when the metal undergoes an exothermic reaction.

Fuel Cell with Internal Thermally Integrated Reformer

GENCELL CORP *U.S. Patent 6,602,626*

An apparatus for autothermal reforming hydrocarbon fuel in a fuel cell stack includes a plurality of fuel cells stacked together. Each fuel cell has an inlet manifold, and all are aligned to form a chamber. A wand of porous, ceramic Al₂O₃ supporting a deposited Pt, Pd, Ru or Ni catalyst extends through the manifold. A mixing device is positioned within the wand and carries fuel gas and oxidant throughout the wand.

Fuel Cell Generating Element

TOSHIBA INT. FUEL CELLS CORP

Japanese Appl. 2003/086,192

The generating element of a fuel cell comprises a fuel electrode; a catalyst/oxide/polymer electrolyte thin layer of a surface-modified oxide selected from: oxides or from a SO₃H group, a COOH group, a PO₃H group or an OH group; and a metal catalyst layer of Pt, Pd, Rh and/or Ir on a C powder or fibre used as the oxidant electrode; with an electrolyte polymer membrane between. The performance of the fuel cell increases by preventing the permeation of the fuel, such as H₂ or MeOH, to the oxidant.

ELECTRICAL AND ELECTRONIC ENGINEERING

Laminated Magnetic Recording Media

IBM CORP *World Appl. 03/065,356*

A laminated magnetic recording medium (1) for data storage has an antiferromagnetically coupled layer (2), made of Ru, Rh, Ir, Cr, Cu and their alloys, and a single ferromagnetic layer separated by a nonferromagnetic spacer layer (3). (2) is formed as two ferromagnetic films coupled across an antiferromagnetically coupling film of composition and thickness to induce antiferromagnetic coupling. Layer (3) prevents antiferromagnetic exchange coupling. (1) has better thermal stability and less intrinsic media noise.

Magnetoresistive Memory Cell Structures

T. ZHU *et al.* *U.S. Appl. 2003/0,147,273*

A magnetoresistive memory structure with superior selectivity has cells with two pinned magnetic layers, formed with antiparallel magnetisation orientation (net magnetic moment is 0), on one side of a free magnetic layer separated by a Ru layer. More predictable switching behaviour and increased write selectivity of the memory cells are obtained.

One-Step Deposition for FeRAM

TEXAS INSTRUMENTS INC *U.S. Patent 6,576,482*

A one-step method to deposit successive layers of a transition metal Al oxynitride and a transition metal Al nitride over a substrate by sputter deposition, using a transition metal/Al target in a N₂-containing atmosphere is claimed. In another one-step method, the top electrode, such as an Ir/IrO, and diffusion barrier layer, and a hard mask layer are formed using two sputter deposition chambers, one with an Ir target and another with a TiAl target. A hard mask layer and upper diffusion barrier layer for the capacitor stack of a FeRAM can be deposited.

Etching Platinum Using a Silicon Carbide Mask

APPLIED MATERIALS INC *U.S. Patent 6,579,796*

Pt is etched using a SiC mask (1) by providing an etch stack including a patterned SiC layer overlying a layer of Pt, then pattern etching the Pt layer using a plasma generated from a source gas of Cl₂, BCl₃ and a nonreactive, diluent gas. (1) can be deposited and patterned using standard techniques, and can be easily removed without damaging either the Pt or an underlying doped substrate material. A smooth Pt etch profile and an etch profile angle of about 75–90° are obtained. Methods of forming semiconductor structures useful in the preparation of DRAM and FeRAM cells are also disclosed.

Magnetic Recording Media with High SNR

SEAGATE TECHNOLOGY LLC *U.S. Patent 6,596,341*

Magnetic recording media (1) are produced by sputter depositing a magnetic alloy overlayer of Co and Pt onto a nonmagnetic underlayer. Thermally unstable small grains are eliminated by heating at 150–600°C. A layer of nonferromagnetic Cr, Mn or Ta is deposited, and then heated to diffuse into the grain boundaries of the heat-treated magnetic alloy layer. (1) has particular applicability to a high area density magnetic recording media exhibiting high coercivity and thermal stability.

Elastic Electric Contact

TAIKO DENKI CO LTD *Japanese Appl. 2003/124,396*

An elastic electric contact (1) is composed of an elastic member by forming Si into a semi-spherical shape and a conductive band-like film composed of a head, a body and an extended part integrally formed from Pd and Ti. The head is formed from a lower layer and a Au plating upper layer. (1) has a longer service life and provides reliable electrical connection.

MEDICAL USES

Novel, Water-Soluble, Antitumour Porphyrins

ZENTARIS AG *World Appl. 03/064,424*

Novel, H₂O-soluble porphyrin Pt compounds of the tetraarylporphyrin Pt derivatives type or the hematoporphyrin Pt derivatives type with high tumour selectivity are synthesised and their cytotoxicity obtained. The compounds are particularly suitable for photodynamic antitumour therapy.