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NEW PATENTS

APPARATUS AND TECHNIQUE

Oxidative Destruction of Harmful Trace Substances

JAPAN SCI. TECHNOL. CORP *U.S. Patent* 6,896,790

An apparatus (1) for oxidative destruction of harmful trace substances in polluted H_2O or gas exhaust comprises two or more chambers with anodes, each coated with an electrically conductive oxide of Ru, Ti and/or Sn. A porous ceramic partition divides the anodes and surrounding cathodes of metal plate fused with Pt on both sides. (1) contains a rectangular wave discharging device to apply an electric field to irradiate polluted H_2O flowing through the chambers.

Determination of Biomarkers in Very Small Amounts

FORSKARPATENT I SYD AB *U.S. Patent* 6,897,035

A highly sensitive biosensor for the determination or detection of freshness biomarkers, such as histamine, in food and beverages, is claimed. It comprises an electrode and a mono- or bi-enzyme system, such as an amine oxidase and/or a horseradish peroxidase. The enzymes are crosslinked into an Os-based redox polymer, such as poly(1-vinylimidazole) with $[Os(4,4'\text{-dimethyl-bi-pyridin})_2Cl]^{+/2+}$ and polyethyleneglycol)diglycidyl ether as the crosslinking agent.

HETEROGENEOUS CATALYSIS

Treatment of Compression Ignition Engine Exhaust

JOHNSON MATTHEY PLC *European Appl.* 1,537,309

A compression ignition engine is operable in a first, normal, running mode and a second mode. The second mode produces exhaust gas with increased CO relative to the first mode. In use the engine can be switched between the two modes. An exhaust system uses a supported Pd catalyst (1) promoted by oxides of Mn, Fe, Cu, etc. An optionally, supported Pt catalyst is placed with and/or downstream of (1). CO is oxidised by the Pd during second mode operation.

Lean-Burn Engine Catalyst

HTE AG *World Appl.* 2005/021,137

A catalyst for exhaust gas purification in lean-burn engines in rich-lean and constant lean mode, comprises ZrO_2 and/or Ce/Zr mixed oxide support and Ru as an active metal either alone or with Pt or Rh. La and Ce oxides and transition metals are promoters.

Improved Diesel Exhaust Filter

DOW GLOBAL TECHNOL. INC *World Appl.* 2005/021,138

An improved diesel exhaust filter has a rigid porous wall portion formed of acicular mullite coated with precious metal catalyst. The diesel oxidation catalyst comprises Pt; a Ba salt NOx adsorber (1); and a three-way catalyst of Pt, Rh and/or Pd. Soot in the exhaust gas is trapped inside the wall and catalytically oxidised to CO; NO is oxidised to NO_2 which is absorbed by (1). (1) is regenerated and the remaining hydrocarbon and CO are catalytically converted to N_2 and CO_2.

Organic Colloidal Dispersion for Diesel Fuels

RHODIA ELECTRON. CATAL. *Word Appl.* 2005/032,705

A colloidal dispersion (1) comprising Ce compound particles, an acid and an organic phase is characterised by also containing a compound of Rh and/or Pd. The dispersion comprises particles of a compound of Ce, another rare earth and/or Fe. (1) can be used as an additive for diesel fuels.

Catalytic Conversion of Alkanes to Alcohols

ESKOM HOLDINGS LTD *World Appl.* 2005/037,746

A gas-phase process for catalytic conversion of a lower alkane (containing $\leq$ 5 C atoms) to alcohols and/or aldehydes is presented. A lower alkane, such as CH_4, is contacted with an oxidising agent in the presence of a catalyst comprising Pt complex(es) (1), having a Pt cation core, supported on Al_2O_3, SiO_2, TiO_2, etc. (1) contains $\geq$ 2 amino, hydroxyl and immidazolyl ligands which are chemically bonded to the support. It also has four other ligands selected from hydroxyl, chloro and amino ligands.

Bifunctional Layered Photocatalyst/Thermocatalyst

WEI DI *et al.* *U.S. Appl.* 2005/0,129,591

A photocatalytic/thermocatalytic coating for improving indoor air quality includes an inner layer of Pt/TiO_2, Au/TiO_2 or Mn oxide/TiO_2 applied on a honeycomb, and an outer layer of TiO_2 or metal oxide doped TiO_2 applied on the inner layer. The outer layer is thin and porous allowing the contaminants in the air to diffuse through and adsorb onto the inner layer. Photons of UV light are absorbed by the coating, forming reactive hydroxyl radicals, which oxidise the contaminant to give H_2O, CO_2, etc.

High-Temperature Catalyst for Decomposition

BOEING CO *U.S. Patent* 6,887,821

A robust, high-activity catalyst (1) for use in the high-temperature decomposition of propellants, including 70–99% H_2O_2, comprises (in wt.%): 30–50 Ag-Pd alloy; 0–40 Mn dioxide; 0–40 Dy oxide; and 10–20 Al_2O_3. (1) requires no special preheating and has start-up transients of < 1 s using the catalyst bed and propellant temperatures of 50°F. (1) has high decomposition efficiency, extremely low decomposition roughness, and a long operating life. Uses include target, space, and on-orbit propulsion systems, etc.

Carbide/Nitride-Based Fuel Processing Catalysts

REGENTS UNIV. MICHIGAN *U.S. Patent* 6,897,178

Highly active catalysts (1) for the water gas shift reaction contain a catalytic composition of a late transition metal supported on Mo and/or W carbides, nitrides, or mixed carbide nitrides. (1) comprise: 0.1–10 wt.% of Pt, Pd, Ru, Co, Ni, Co, Ag, and/or Au, especially Pt, Ni and Au. The water gas shift reaction may be catalysed by contacting a gaseous stream containing CO and H_2O with solid (1).

HOMOGENEOUS CATALYSIS

Ruthenium(II) Catalyst for Ketone Reduction

UNIV. DEGLI STUDI UDINE *World Appl.* 2005/051,965

Ru(II) complexes (1) containing a cyclometallated phosphine are effective catalysts for ketone reduction to alcohols *via* transfer hydrogenation. With (1), and 2-propanol as a H source, the corresponding alcohol is rapidly produced in high yield, starting from linear and cyclic diaryl, alkylaryl and dialkyl ketones. From ketones various types of alcohol, that are important intermediates for the pharmaceutical, agrochemical and fine chemical industries, can be produced.

Cycloolefin Addition Polymer

JSR CORP *World Appl.* 2005/054,312

A cycloolefin addition polymer, having a range of molecular weights suitable for optical sheet and film material, is produced from small amounts of molecular weight modifier (ethylene) and a Pd catalyst (1) by addition polymerisation of a cycloolefin compound. (1) includes: (a) Pd compound; (b) ionic- and/or Lewis acid Al and B compounds; and (c) a phosphine compound or its phosphonium salt.

FUEL CELLS

Cathode Catalyst for Fuel Cell

CATALER CORP *European Appl.* 1,526,592

A cathode catalyst (1) for fuel cells comprises a supporting layer of a Pt and Fe alloy, and a further third component with an affinity for Fe, such as W, Ti, Mo, Re, etc. (1) is loaded onto a C powder support. (1) can maintain the durability of a battery and enables the batteries to become high output. Alloying with the third component could prevent eluting of the Fe into the electrolyte.

Fuel Cartridges for Fuel Cells

SOCIETE BIC *World Appl.* 2005/036,944

A fuel supply for a fuel cell can be a pressurised or non-pressurised cartridge, usable with any fuel cell, such as a DMFC or a reformer fuel cell. In one aspect, the fuel supply may contain a reaction chamber comprising Pt or Ru to convert fuel to H_2. The fuel supply may also contain a pump and a valve connecting the fuel to the fuel cell, and a vent to vent gas from the fuel supply.

ELECTRICAL AND ELECTRONIC ENGINEERING

Semiconductor Films on Flexible Iridium Substrates

UT-BATTELLE LLC *U.S. Patent* 6,872,988

A laminated semiconductor article includes a flexible substrate with an optional biaxially textured oxide buffer system on the flexible substrate (1). A biaxially textured Ir-based buffer layer containing $Ir_{1-x}M_x$ alloy where M is Pt, Pd, Rh, Ru, Os, Ta, Ti, Cu, etc., is placed on (1) and epitaxial layer(s) of semiconductor over the Ir buffer layer. Ir can serve as a substrate with an epitaxial layer of the semiconductor.

Platinum Interconnect

ANALOG DEVICES INC *U.S. Patent* 6,878,626

A metallisation stack is provided for use as a contact structure in an integrated MEMS (microelectromechanical) device. The metallisation stack includes a Ti-W adhesion and barrier layer with a Pt layer on top. The Pt layer is formed by sputter etching the Pt in Ar, followed by a wet etch in *aqua regia* using an oxide hardmask. Alternatively, the Ti-W and Pt layers are deposited sequentially and patterned by a single plasma etch process with a photoresist mask.

Semiconductor with High-K Dielectric

ADV. MICRO DEVICES INC *U.S. Patent* 6,894,355

A semiconductor device (1) has a silicide source and a silicide drain with a semiconductor body between them. (1) has a gate electrode of Pt, Pd, Rh, Ru, Ti nitride, etc., disposed over the body and defining a channel interposed between the source and the drain. The gate dielectric is made from a high-K material, such as oxides of Hf, Zr, Ce, Al, etc., and separates the gate electrode from the body.

Magnetisable Device for Ultrahigh-Density Recording

NANOMAGNETICS LTD *U.S. Patent* 6,896,957

A magnetic recording medium includes a magnetisable layer comprising a plurality of ferri- or ferromagnetic particles selected from Pt, Co, Fe, Ni, etc., each having a dimension of ≤ 100 nm, and each being a separate ferromagnetic domain. The magnetisable device may be used as a magnetic storage device of improved data storage characteristics. The particulate media meet requirements for ultrahigh-density recording.

Ruthenium-Aluminum for Magnetic Recording

SEAGATE TECHNOL. LLC *U.S. Patent* 6,908,689

A magnetic recording medium (1) containing a B-2 structured Ru-Al underlayer comprising a (200) crystallographic orientation with a thickness from ~ 50–800 A and a magnetic layer of CoCrPtB, etc., having a Co(11.0) crystallographic orientation. (1), deposited on mechanically textured and surface-oxidised NiP film, has a relatively high remanent coercivity and a relatively high signal to medium noise ratio. (1) is an oriented medium, with orientation ratio (OR-Mrt) ≥ 1.05 (Mr = magnetic remanence, t = magnetic film thickness).

TEMPERATURE MEASUREMENT

Fabrication of Nanoscale Temperature Sensors

UNIV. CENT. FLORIDA *U.S. Patent* 6,905,736

Nanoscale temperature sensors and heaters are fabricated using focused ion beam (FIB) techniques for CVD. The FIB Ga^+ ion beam decomposes $W(CO)_6$ or $Pt(CH_3)_3$ molecules to deposit W or Pt nanostrips (containing Ga impurities) on a substrate. The Pt(Ga)/W(Ga) nanoscale junction indicates a temperature coefficient of ~ 5.4 mV/°C, which is ~ 130 larger than for conventional K-type thermocouples.