DOI: 10.1595/147106706X124669

NEW PATENTS

METALS AND ALLOYS

Nickel-Based Superalloy

HITACHI LTD *British Appl.* 2,418,207

A nickel-based superalloy (1) includes (in wt.%): 3–7 Cr, 3–15 Co, 4.5–8 W, 3.3–6 Re, 4–8 Ta, 0.8–2 Ti, 4.5–6.5 Al, 0.1–6 Ru, 0.01–0.2 Hf, < 0.5 Mo, ≤ 0.06 C, ≤ 0.01 B, ≤ 0.01 Zr, ≤ 0.005 O, ≤ 0.005 N, and optionally a rare earth element at 0.1–100 ppm, with the balance Ni. Single crystal turbine blades can be made from (1). (1) has excellent mechanical strength and resistance to corrosion and oxidation.

ELECTRODEPOSITION AND SURFACE COATINGS

Pd-Containing Coating

ELTECH SYST. CORP *World Appl.* 2006/028,443

An electrocatalytic coating (1) of mixed metal oxide, preferably containing Pt group metal oxides, and an electrode using (1) are used for the electrolysis of a halogen-containing solution. (1) includes a topcoating layer of oxides of Pd, Rh or Co. The Pd oxide component reduces the operating potential of the electrode and removes the necessity of a 'break-in' period to reach the lowest electrode potential.

Low-Pressure Deposition of Ru and Re Layers

TOKYO ELECTRON LTD *U.S. Appl.* 2006/068,588

A low pressure method for depositing Ru and Re layers at high deposition rates, with low particulate contamination and good step coverage is described. A Ru- or Re-carbonyl precursor is processed with a carrier gas in a process chamber at a pressure of < 20 mTorr. The metal is deposited onto a surface by thermal chemical vapour deposition.

Ru Film-Forming Ink

JAPAN SCI. TECHNOL. AG *Japanese Appl.* 2005-336,263

An ink can be used to form films of metallic Ru or Ru oxide on a resin film substrate such as polyimides. The ink contains a compound obtained by preheating a β-diketone, β-ketoester or β-diester complex of Ru in an alcohol solution. This ink can be applied to a surface and heated to give the films.

APPARATUS AND TECHNIQUE

Membrane for Diffusion Limited Gas Sensors

GENERAL ELECTRIC *British Appl.* 2,417,561

A micro fuel cell sensor for measuring selected gases in fluid streams is claimed. The sensing element has identical first and second gas diffusing electrodes, made from at least one of Pt/C, Au, Pd, Pd-Pt, Ru, Ir, Os, Rh or Ta. The electrodes are separated from gas-containing media by gas-permeable membranes. A spacer having an acidic electrolyte is placed between the electrodes, facilitating electrochemical oxidation and reduction of gases at the electrodes.

Graphitic Nanotubes in Luminescence Assays

MESO SCALE TECHNOL. LLC *U.S. Patent* 7,052,861

Electrochemiluminescent complexes of Ru, Os or Re, in particular of Ru (1), are attached to C nanotube supports together with an enzyme cofactor (2), and are used in luminescence assays. The analyte of interest can be detected by bringing the sample into contact with the assay composition, causing oxidation or reduction of (2) and electrochemiluminescence of (1). The latter can be correlated to the presence or amount of analyte.

HETEROGENEOUS CATALYSIS

Multiple Layer Exhaust Gas Catalyst

CATALER CORP *European Appl.* 1,640,575

An exhaust gas catalyst system contains multiple layers of catalysts on solid support. The first layer contains a noble metal active component including Rh, and optionally Pt, with a barely soluble Ba compound. The second layer contains another noble metal which may include Pt or Pd. The system is structured so that the two layers come into contact with the exhaust gas sequentially.

Manufacture of Noble Metal Alloy Catalysts

UMICORE AG CO KG *U.S. Appl.* 2006/094,597

Supported noble metal catalysts (1) are manufactured with a high degree of alloying and small crystallite size, < 3 nm, using polyol solvents in a two step process. The first component is a transition metal such as Co, Cr, Ru, preferably Ru; the second is a noble metal such as Pt, Au, Ag, Pd, Rh, Os, Ir or a mixture. (1) can be used as electrocatalysts in fuel cells or as gas-phase catalysts for CO oxidation or exhaust gas purification.

Low-Emissions Diesel Fuel

CLEAN DIESEL TECHNOL. INC *U.S. Patent* 7,063,729

A low-emissions diesel fuel is composed of aviation kerosene, detergent, lubricity additive and a bimetallic, fuel-soluble Pt and Ce fuel-borne catalyst. Retarding engine timing can further reduce NOx and the use of a diesel particulate filter and/or diesel oxidation catalyst can further reduce CO, unburned hydrocarbons and particulates.

Exhaust Gas Cleaning Catalyst

TOYOTA CENTRAL RES. DEV. LAB. INC *Japanese Appl.* 2005-305,217

An exhaust gas cleaning catalyst exhibits high NOx removal activity even after exposure to a high-temperature atmosphere, and is prevented from being poisoned by sulfur. There are two catalysts, prepared with a porous oxide powder carrier and a NOx occlusion material, the first carrying Pt and the second containing θ-alumina and carrying Rh. The catalysts intermingle but remain separated by their carriers.

HOMOGENEOUS CATALYSIS

Ring-Closing Metathesis Process

BOEHRINGER ING. INT. GmbH *U.S. Appl.* 2006/063,915

A process is described for preparing compounds (1) which are active for the treatment of hepatitis C viral (HCV) infections, or are intermediates for the preparation of active compounds. (1) are formed by cyclising diene compounds (2) in a suitable organic solvent, in the presence of a Ru catalyst (3). The process is performed in a gas such as CO_2 or a gas mixture at supercritical or near-supercritical conditions, with (3) at ~ 25–50 mol% relative to (2).

Process for Oxidation of Alkanes

CSIR *U.S. Appl.* 2006/142,620

A Pd complex (1) catalysed process for the oxidation of linear alkanes is claimed which employs molecular O_2 as the oxidant, to produce secondary alcohols and ketones in high selectivity. (1) may include monodentate, bidentate or polydentate ligands up to a maximum Pd coordination number of 4. The process may be carried out under a continuous feed of pure or diluted O_2 or in air, in the presence or absence of a solvent, and does not require the use of a co-catalyst.

Acetic Acid Production Methods

CELANESE INT. CORP *U.S. Patent* 7,053,241

A method for production of acetic acid by carbonylation of MeOH involves a Rh-based catalyst system, with at least one catalyst stabiliser (1) selected from Ru- or Sn-salts or a mixture. Precipitation of Rh during recovery of acetic acid is minimised by (1), even in low H_2O content reaction mixtures and in the presence of an iodide salt copromoter at > ~ 3 wt.% of the reaction mixture. (1) may be present at molar concentrations of metal to Rh from ~ 0.1:1–20:1.

Curable Silicone Releasing Agent Composition

SHIN-ETSU CHEM. CO LTD *Japanese Appl.* 2005-314,510

The composition of a curable silicone film with small peel resistance at low-speed/high-speed peeling, with slipperiness and good resistance to air exposure is described. The film includes: (A) a diorganopolysiloxane containing 0.5–5 mol% alkenyl groups bonded to Si; (B) a diorganopolysiloxane with alkenyl groups bonded to Si at the terminals of the molecular chain; (C) an organohydrogenpolysiloxane; and (D) a catalytic amount of Pt-based catalyst.

FUEL CELLS

Carbon Nanotube Pastes and Methods of Use

O. MATARREDONA *et al.* *U.S. Appl.* 2006/039,848

Dispersible pastes consisting of C single-walled nanotubes (SWNTs) in H_2O or an organic solvent are prepared. These pastes can be impregnated with noble metal precursors including compounds of Pt. The SWNT-Pt composites can have small Pt clusters distributed evenly over the surface and can be used as catalysts or as electrodes for fuel cells.

Carbon-Supported Alloy Nanoparticle Catalysts

RES. FOUND. STATE UNIV. NEW YORK *U.S. Patent* 7,053,021

C-supported core-shell PtVFe nanoparticle electrocatalysts (1) are formed from a reaction solution (2) including precursors containing metals or salts of Pt, V and Fe plus an organic compound. The process produces nanoparticles of controlled size within the range 1.0–10.0 nm, the size being determined by the composition of (2). (1) are particularly useful for O_2 reduction reactions (ORR), exhibiting ORR catalytic activities in the range ~ 2–4 times that of a standard Pt/C catalyst.

Reduced Cost Catalyst for Fuel Cell

NISSAN MOTOR CO LTD *Japanese Appl.* 2005-332,662

Manufacturing costs for a fuel cell catalyst containing Pt plus Ir oxide (1) are reduced using the described method. First an Ir complex is formed from a mixture of Ir chloride solution and a hydroxide of an alkali metal or alkaline earth metal. This complex is deposited onto a C support, then baked to high temperature to form (1), without burning the support. Finally Pt is added to the catalyst support which contains (1).

ELECTRICAL AND ELECTRONIC ENGINEERING

Self-Aligned Silicide Contact

IBM CORP *U.S. Appl.* 2006/051,961

A self-aligned Ni alloy silicide contact is described. A conductive Ni-Pt alloy is first deposited onto a Si-containing semiconductor structure. An O_2 diffusion barrier is deposited to prevent metal oxidation, then an annealing step causes formation of a Ni-Si, Pt-Si contact in regions in contact with Si. Finally a selective etching step removes unreacted Ni-Pt from regions not in contact with Si.

Iridium Oxide Nanowires

SHARP LAB. INC *U.S. Appl.* 2006/086,314

Ir oxide nanowires (1) are grown from an Ir-containing precursor, using a MOCVD process from the surfaces of a growth promotion film which has non-continuous surfaces. (1) have a diameter in the range of 100–1000 Å, a length in the range of 1000 Å–2 μm and an aspect ratio (length:width) of > 50:1. (1) include single-crystal cores covered with an amorphous layer of < 10 Å thickness.

Magnetic Recording Media

SEAGATE TECHNOL. LLC *U.S. Patent* 7,041,394

A magnetic recording disc includes a disc substrate of glass, quartz, Si, SiO_2, ceramic or AlMg, with an etched locking pattern of multiple pits, completely filled with chemically synthesised nanoparticles (1) of a single magnetic species. (1) may consist of Fe-Pt, Co-Pt, Fe-Pd or Mn-Al, and have a grain size of 3–10 nm. (1) exhibit short-range order characteristics, forming self organised magnetic arrays.