

NEW PATENTS

METALS AND ALLOYS

Oxide-Dispersion Strengthened Platinum Material

TANAKA KIKINZOKU KOGYO KK

European Appl. 1,712,646

An oxide-dispersion strengthened material (1) formed from Pt or alloys of Pt-Rh, Pt-Au, Pt-Rh-Au or Pt-Ir is claimed, which is stable in use at high temperatures and has excellent weldability. Dispersed additive metal particles (2) are selected from Zr, Ca, Y or Sm and have average diameter of 0.2 μm or less, average interparticle distance 0.01–2.7 μm and concentration 0.01–0.5 wt.%. The oxidation rate of (2) is 50–100%, and the concentration of unbound O within (1) is ≤ 100 ppm.

ELECTRODEPOSITION AND SURFACE COATINGS

Platinum Aluminide Coatings for Turbine Components

HONEYWELL INT. INC

U.S. Appl. 2006/0,222,776

Turbine components such as vanes or blades are coated with an environment-resistant Pt aluminide coating (1) by cold gas-dynamic spraying a powder material containing Al, Pt and at least one other material chosen from Ni, Cr, Hf, Si, Y, Re, Zr, Co and Ta. After coating, at least one thermal diffusion treatment such as a hot isostatic pressing process, vacuum heat treatment, or heat treatment in inert atmosphere, is applied to metallurgically homogenise the coating. (1) contains (in wt.%): ≤ 50 Pt, ~ 12 –30 Al, ~ 2 –25 Cr, ~ 0.1 –5 Hf, ~ 1 –5 Si, ~ 0.1 –3 Y, ~ 0.1 –3 Zr, and the balance consists of Ni.

APPARATUS AND TECHNIQUE

Ruthenium Complex Dye for Oxygen Sensing

ROSEMOUNT ANAL. INC

U.S. Appl. 2006/0,228,804

A Ru complex luminescence dye (1) for O sensing consists of Ru(II)-tris(4,7-diphenyl-1,10-phenanthroline) modified by covalently bonding long-chain hydrophobic organic groups containing $\text{C}_{12}\text{H}_{25}$ to the ligands. (1) have increased solubility in non-polar organic solvents such as toluene. Optical O sensors include a source of excitation illumination, a sensing layer containing (1) which receives excitation illumination and generates luminescence based on the concentration of O, and a luminescence sensor.

Platinum Apparatus for Manufacturing Glass

FURUYA KINZOKU KK

Japanese Appl. 2006-169,085

Glass manufacturing apparatus is made of Pt or Pt alloy with a surface roughness of $R_{\text{max}} < 4 \mu\text{m}$ and $R_a \leq 0.1 \mu\text{m}$. This gives reduced contact resistance between the Pt surface and the molten glass, leading to reduced friction and improved wettability. Wrinkles and surface deformation caused by expansion and shrinkage at high temperature are suppressed, and contamination of glass by Pt particles during manufacture is inhibited.

JOINING

Brazing Diamond Using a Metal Interlayer

SMITH INT.

British Appl. 2,426,223

A cutting element consists of a substrate, a thermally stable polycrystalline diamond layer, a metal interlayer of Mo or Ni and a braze joint (1) securing diamond to substrate. (1) is a NiPdCr braze alloy, and may be coated with carbide, Ru, W or Ta. (1) has shear strength $> 60,000$ psi and thickness $< 0.003''$.

HETEROGENEOUS CATALYSIS

Reforming Catalyst Containing Rhodium

JOHNSON MATTHEY PLC

British Appl. 2,424,196

A reforming catalyst (1) containing Rh or Rh-Pt particles, and including a promoter metal such as Ba, on a support material such as ceria or ceria and zirconia dispersed on an Al ion containing oxide is claimed. (1) can be used in a fuel processing system for reforming diesel or a diesel-type fuel. The atomic ratio of Rh or Rh-Pt to Ba is between 50:1–1:5.

Alkane Aromatisation Using Platinum-Zeolite Catalyst

SAUDI BASIC IND. CORP INC

European Appl. 1,699,746

A Pt/ZSM-5 crystalline zeolite catalyst containing 0.05–5% Pt is used in aromatisation of 1–4 C alkanes to aromatics such as benzene, toluene and xylenes by a process such as a Cyclar-type process. Temperatures are between 350–650°C and pressures are 10–2000 kPa. A byproduct of the process is a light gas fraction containing ethane and methane, with a mole fraction ratio of ethane relative to methane between 2–10, which can be used as a feedstream for a cracker.

Membrane Apparatus and Production of Hydrogen

ROBERT GORDON UNIV.

U.S. Appl. 2006/0,239,874

An apparatus and method for producing H_2 gas, in particular synthesis gas, includes an α -alumina membrane treated with a TiO_2 washcoat on one side and an active γ -alumina layer on the other. A metal catalyst, preferably Rh, is deposited within the pores of the alumina. Advantages include 100% conversion rates for O_2 , and separate feed streams enabling safe use of optimal ratios of O_2 and methane. The synthesis gas can be produced from normally gaseous hydrocarbons obtained from remote oil wells, and converted to liquid hydrocarbons for transport.

Exhaust Gas Purifying Catalyst

CATALER CORP

U.S. Appl. 2006/0,270,550

An exhaust gas purifying catalyst prevents alloying of precious metal particles even at high operating temperatures, to inhibit catalyst degradation. There is a substrate with a catalyst coating containing Rh (1), Pt and/or Pd (2), plus a refractory inorganic oxide. Weight ratio of (1):(2) is 1:0–1:1 in the upstream part relative to exhaust gas flow, and in the downstream part the weight of (2) is greater than that of (1). The upstream part is 60–94% of the total system volume.

Black Photocatalyst for Forming Hydrogen

TOKYO UNIV. SCI. *Japanese Appl.* 2006-167,652

A photocatalyst (1) for hydrolysis is capable of using visible light efficiently. (1) includes a solid solution of CuInS_2 substituted with Ag or Ga to give $\text{Cu}_{1-x}\text{Ag}_x\text{InS}_2$ ($0.4 \leq x \leq 0.6$) or $\text{CuGa}_{1-y}\text{In}_y\text{S}_2$ ($0.7 \leq y \leq 0.9$). Ru, Pt or Rh is present as a photocatalyst promoter. On irradiation with visible and near-IR light, (1) generates H_2 by photocatalytic hydrolysis of an aqueous solution containing S compounds which include SO_3^{2-} and S^{2-} .

HOMOGENEOUS CATALYSIS

Rhodium Crosslinking Silicone Elastomers

WACKER-CHEMIE GmbH *U.S. Patent* 7,129,309

An addition-crosslinked silicone elastomer (1) is formed in the presence of at least one Rh or Ir hydrosilylation catalyst, such as $\text{Rh}_2(\text{C}_8\text{H}_{15}\text{O}_2)_4$ or $[\text{IrCl}(\text{olefin})_2]_2$, or a mixture. (1) can be made transparent and colourless, is flexible and is suitable for use as food and baking moulds in the food industry. The catalysed addition crosslinkable components display excellent pot life and good high-temperature cure.

Hydrogenation of an Unsaturated Compound

BASF AG *U.S. Appl.* 2006/0,247,459

A monoolefinically unsaturated compound bearing at least two functional groups selected from nitrile, carboxylic acid, carboxylic ester or carboxamide groups, is hydrogenated to a saturated compound in the presence of a homogeneous catalyst containing Rh, Ru, Pd, or Ni, preferably Rh, such as $\text{Cp}^*\text{Rh}(\text{C}_2\text{H}_4)_2$. The Rh-containing catalyst is used in the addition step to add terminal olefins bearing the required functional groups to a precursor compound, and the same catalyst is retained in the reaction mixture and used for the hydrogenation step. Hydrogenation is carried out at a partial H_2 pressure of 0.1–200 bar, average mean residence time of 0.1–100 hours, and temperature of 30–160°C.

FUEL CELLS

Catalyst for Fuel Electrode

TANAKA KIKINZOKU KOGYO KK *European Appl.* 1,710,856

A catalyst for a SPFC electrode is composed of fine precious metal particles (1), on an electrically conductive support such as C, in the weight ratio (1):C between 60:40–95:5. (1) may include Pt and Ru in the molar ratio 1:1–1:3, and have average particle diameter 3–10 nm. (1) also contain O, in the weight ratio (1):O between 86:14–96:4.

Fuel Cell Electrode Catalyst

GENERAL MOTORS *World Appl.* 2006/124,248

A PEMFC with improved durability is claimed, by replacing a C support in the cathode with Ti oxide mixed with electrically conductive particles of C. Pt particles are deposited on the Ti oxide support to give good O reduction capability and corrosion resistance in acid environment.

Electrode Catalyst Layer

NISSAN MOTOR CO LTD *Japanese Appl.* 2006-147,345

An electrode catalyst layer for a PEMFC includes a conductive catalyst support, a catalyst containing Pt and a proton conductive polymer. A Pt-capture agent (1) capable of scavenging Pt ions is included to prevent loss of Pt over time. (1) generates an organic Pt complex of coordination number 2–4.

ELECTRICAL AND ELECTRONIC ENGINEERING

Black Electrodes with Ruthenium

DU PONT *European Appl.* 1,701,372

A black electrode (1) is formed by sintering at a temperature of 500–600°C after applying a Pb-free black conductive composition (2) to a substrate. (1) includes a crystallised glass component as a binder. (2) includes (in wt.%): 4–30 conductive particles of black RuO_2 , Pb-free black Ru-based polyoxides selected from $\text{Bi}_2\text{Ru}_2\text{O}_7$, $\text{Cu}_x\text{Bi}_{2-x}\text{RuO}_7$, $\text{GdBiRu}_2\text{O}_7$, or a mixture; 0–30 Pb-free non-conductive black oxide; and 10–50 Pb-free Bi-based glass binder.

Material for Probe Pins

TANAKA KIKINZOKU KOGYO KK *U.S. Appl.* 2006/0,197,542

Probe pins (1) are made of one or more elements selected from Pt, Ir, Ru, Os, Pd and Rh and have a Vickers hardness of ≥ 300 . In particular, (1) may be formed from (in wt.%): 5–30 Rh and the balance Ir, or 5–40 Ir and the balance Pt. Optionally W, Ni and/or Co may be added, to give for example (in wt.%): 5–10 W, 5–30 Ni or 10–30 Co and the balance Pt. (1) are incorporated into probe cards.

Printed Circuit Board Using Ag-Pd Nanoparticles

H.-J. CHO *et al.* *U.S. Appl.* 2006/0,208,230

A conductive ink (1) is dispersed with Ag-Pd alloy nanoparticles containing 5–40 wt.% Pd, of diameter 1–50 nm. (1) is formed by dissolving Pd acetate and Ag acetate in sodium dodecyl sulfate aqueous solution and then heating. A PCB is manufactured by spraying (1) onto a substrate, for example by using ink-jet printing to form a pattern, and curing to form wiring. Migration of Ag ions is reduced, and competitive price and excellent conductivity are claimed.

MEDICAL USES

Biocompatible Bonding Method

SECOND SIGHT MED. PROD. INC *U.S. Patent* 7,142,909

An implantable device includes a hermetically sealed electronics control unit such as an electrically insulated integrated circuit, bonded directly to a flexible circuit or electrode. Bonding is achieved using a deposited rivet (1) of a biocompatible material such as Pt or Au, preferably Pt. (1) is formed by electrochemical deposition at a current density of 50–2000 mA cm^{-2} . The device is suitable for long-term implantation into living tissue, such as for a retinal or cortical electrode array, and may enable the restoration of sight to certain non-sighted people.