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NEW PATENTS

CATALYSIS – APPLIED AND PHYSICAL ASPECTS

Novel PGM Catalysts

DSM IP ASSETS BV *World Appl.* 2008/101,602

Novel pgm catalysts are prepared from a reverse microemulsion of a pgm, preferably Pd, in a H_2O-in-hydrocarbon system. Some of the solvent is evaporated, preferably under reduced pressure, then a C_1–C_4 alcohol such as MeOH is added to form a precipitate of pgm nanoparticles. These can be used as structured catalysts, for example in woven fabrics.

CATALYSIS – INDUSTRIAL PROCESS

Liquid Fuel Production from Biomass and Coal

CHINA FUEL (HUAIBEI) BIOENERGY TECHNOL. DEV. CO LTD *World Appl.* 2008/101,370

A mixture of cellulose biomass and coal is gasified to obtain synthesis gas, then converted to a liquid fuel in the presence of a catalyst. The catalyst includes MoS_2; an alkaline metal compound selected from salts of Li, Na, K, Rb and Cs; and a component selected from Pt, Pd, Rh, Ir, Os, Mo, V, Re, Co, Ni or a mixture, for activating the C–H bond in alkanes.

Production of Hydrogen Cyanide

DEGUSSA AG *U.S. Patent* 7,429,370

An improvement to the Blausäure-Methan-Ammoniak (BMA) process for the production of HCN by reacting an aliphatic C_1–C_4 hydrocarbon, preferably CH_4, with NH_3 in the presence of a Pt-containing catalyst is claimed. The catalyst is doped with 0.01–20 mol% (relative to Pt) of an element selected from Pd, Cu, Ag, Au and W to reduce sooting and the consequent decrease in activity, and may be supported on Al_2O_3.

Nanocone Silicone Gel

CORNING CABLE SYSTEMS LLC *U.S. Appl.* 2008/0,207,049

A silicone-based gel for use with telecommunication interconnect devices is claimed. It includes approximately equal amounts (w/w) of Part A: (i) 15–20 vinyl terminated polydimethylsiloxane of non-agglomerated SiO_2 (nanocone) nanoparticles; (ii) 80–85 polydimethylsiloxane; (iii) 0.1–0.3 of 0.5% Pt catalyst; and Part B: (i) 5–10 vinyl terminated polydimethylsiloxane of non-agglomerated SiO_2 (nanocone) nanoparticles; (ii) 15–30 hydride terminated polydimethylsiloxane, (iii) 0.2–10 hydride functional polydimethylsiloxane; (iv) 50–80 polydimethylsiloxane.

Producing α-Hydroxyketone Compound

SUMITOMO CHEMICAL CO *Japanese Appl.* 2008-115,128

An α-hydroxyketone compound is produced by reacting a tri-substituted olefin compound with an organic hydroperoxide in the presence of an Os compound and a tertiary amine compound or a tertiary amine oxide compound.

CATALYSIS – REACTIONS

Catalytic Olefin Metathesis

UNIV. BRISTOL *British Appl.* 2,447,068

An olefin metathesis or cross-coupling reaction is carried out using a catalyst system which includes: a source of a *d*-block metal such as a Group VIII metal, Pt, Pd, Rh, Ru, Fe, Co, Cu or Ni; optionally a promoter, an activator and/or a base; and a source of a 3-membered carbocyclic ligand. The catalyst system may be pre-formed or formed *in situ*.

EMISSIONS CONTROL

Octane Number-Increasing Catalyst and Fuel Reformer

NISSAN MOTOR CO LTD *European Appl.* 1,972,776

A fuel reformer for an internal combustion engine includes an octane number-increasing catalyst containing Rh supported on a base material selected from SiO_2, Al_2O_3, CeO_2, ZrO_2, TiO_2, MgO; and a device that supplies O_2. The octane number of liquid-phase fuel can be increased in the presence of O_2. The fuel reformer can enhance the combustion characteristics of an internal combustion engine.

Exhaust Emission Control Device

YAMAHA MOTOR CO LTD *Japanese Appl.* 2008-144,612

An exhaust emission control device for an internal combustion engine purifies exhaust components such as CO, HC and NOx, using three catalysts. The second catalyst carries Rh in the upstream part and Pd in the downstream part. CO and HC are oxidised with secondary air led into the exhaust pipe. Pd is carried in the third catalyst.

FUEL CELLS

Preparing Nanosize Platinum-Titanium Alloys

GM GLOBAL TECHNOL. OPERATIONS INC *U.S. Patent* 7,416,579

Nanometre sized particles containing Ti and Pt are prepared by dissolving or suspending a precursor compound or compounds of Ti and Pt in a low vapour pressure hydrocarbon liquid medium; bubbling a reducing gas such as H_2 through the liquid; and applying ultrasonic vibrations at a temperature below ambient. Ti and Pt are coprecipitated in very small particles and may be used in a catalyst for a PEMFC.

Platinum-Ruthenium Core-Shell Nanoparticles

UNIV. MARYLAND *U.S. Appl.* 2008/0,220,296

PtRu nanoparticles containing a Pt shell and a Ru-based nanoparticle core may be used for the catalytic oxidation of H_2 containing relatively large amounts of CO and can be used for the anode of a PEMFC. Particle size is 1–15 nm; metal content is (at.%): 20–60 Pt and 40–80 Ru; the Pt shell may be 1–2 monolayers thick; and the core contains Ru(0):Ru(IV) in the ratio 100–0:0–100, preferably 60–70:40–30. The particles may be supported on a material such as Al_2O_3.

Electrode Catalyst Composition

NISSAN MOTOR CO LTD *Japanese Appl.* 2008-140,703

An electrode which is capable of restraining or preventing elution of Pt, and has good electrode catalyst activity, includes a N-containing 6-membered ring such as a pyridine ring, coordinated with at least one metal selected from Pt, Pd, Ir, Ni and Co; and a non-electrolyte material. The composition can be used in an anode or cathode catalyst layer for a PEMFC.

METALLURGY AND MATERIALS

Iridium-Based Alloy

JAPAN SCI. TECHNOL. AGENCY *U.S. Appl.* 2008/0,206,090

An Ir-based alloy having high heat resistance and high strength contains (wt.%): 0.1–9.0 Al, 1.0–45 W and the remainder Ir. The metallic structures include a component system containing 0.1–1.5 wt.% Al, in which an $L1_2$-type intermetallic compound $Ir_3(Al,W)$ is precipitated; and a component system containing 1.5–9.0 wt.% Al in which an Ll_2-type intermetallic compound $Ir_3(Al,W)$ and a B_2-type intermetallic compound Ir(Al,W) are precipitated. Part of the Ir may be replaced with Pt, Pd, Rh, Ru, Co, Ni, Fe, Cr or Re; part of the Al and W may be replaced with Ni, Ti, Nb, Zr, V, Ta, Hf or Mo.

PtTi-Based High-Temperature Shape Memory Alloy

NAT. INST. MATER. SCI. *Japanese Appl.* 2008-150,705

PtTi and PtTiIr high-temperature shape memory alloys can be used in applications such as chemical plants and engines at 1000–1200ºC. The alloys include 42–63 at.% Pt and the remainder Ti; alternatively part of the Pt may be replaced by < 50 at.% Ir. The alloy is subjected to homogenising heat treatment at the transformation point or above for ≥ 1 h, and is then subjected to direct quenching at the transformation temperature or below, and is held at this temperature for ≥ 1 h.

APPARATUS AND TECHNIQUE

Hydrogen Purification Membranes

IDATECH LLC *U.S. Appl.* 2008/0,210,088

A H_2 purification device includes at least one H_2-selective membrane made from an alloy of Pd with 10–50 wt.% Au. There may optionally be 5–250 ppm C plus one additional component. The alloy may be S-tolerant. The device can receive a mixed gas stream containing H_2, for example from a coal gasification process, and produce substantially pure H_2 gas. The purification device can be operated between 200–400ºC and ≥ 50 psi.

Antifouling Electrode Composition

PENTEL CORP *Japanese Appl.* 2008-126,184

An electrode composition to prevent adhesion of microorganisms includes (mol%): 35–65 Ir oxide and 65–35 Ta oxide, calculated as metal, carried on a substrate made of Ti or a Ti alloy, with a conductive Ti oxide layer in between.

BIOMEDICAL AND DENTAL

Non-Magnetic Co-Pd Dental Alloy

ARGEN CORP *World Appl.* 2008/115,879

A non-magnetic Co-based dental alloy contains (wt.%): ≥ 25 Pd, 15–30 Cr and the balance Co. There may optionally be an element X selected from Mo, W, Nb, Ta, V and Re. To ensure the alloy is non-magnetic, the concentration of Cr in the alloy is ≥ 20 wt.%. Alternatively if the concentration of Cr is < 20 wt.%, the combined concentration of Cr and X is > 20 wt.%. There may optionally be ≤ 5 wt.% Al, B, Ce, Ga, Ge and/or Si.

ELECTROCHEMISTRY

Electrode for Generation of Hydrogen

PERMELEC ELECTRODE LTD *European Appl.* 1,975,280

The title electrode includes a conductive substrate; a catalytic layer containing at least one pgm selected from Pt, Pd, Rh, Ru and Ir; and a H_2 adsorption layer formed from a material such as C or an oxide of Ta, Nb, Ti, Ni, Zr or a La series metal, on the catalytic layer. There may optionally be at least one pgm oxide and/or at least one metal or oxide selected from La series metals, valve metals, Fe series metals and Ag in the catalytic layer.

Anode for Hydrochloric Acid Electrolysis

TANAKA KIKINZOKU KOGYO KK *Japanese Appl.* 2008-156,684

An anode electrode for HCl electrolysis is claimed to be capable of suppressing erosion of a base material and to have long-term durability. There is a catalytic layer of Ir oxide, Ru oxide or a mixture on a Ti substrate, with an intermediate layer containing Rh, Ir or Ru of thickness 0.5–10 μm which may be formed by plating. High Cl_2-generation efficiency is claimed.

SURFACE COATINGS

Composition for Etching Ruthenium

TOSOH CORP *World Appl.* 2008/129,891

A composition for etching Ru is claimed which does not foul apparatus, is inexpensive and contains no strong alkali. The composition for Ru etching is characterised by comprising Cl_2 and H_2O, containing no F, and having a pH lower than 12.

Palladium-Containing Plating Solution

GREEN HYDROTEC INC *European Appl.* 1,983,076

A Pd-containing electroplating solution can be used to create a Pd or Pd alloy membrane on a porous metal support. The solution contains (g l^{-1}): 2–200 Pd as $PdSO_4$; 10–200 reactive conductive salt; 10–150 complexing agent; and buffering agent sufficient to give a pH from 9–12. There may optionally be a second metal salt selected from a Pt, Cu, Ag, Au, Ni, In or a combination, preferably Cu at 0.2–100 g l^{-1}. The porous support may be a metal or alloy selected from Fe, Cu or Ni or a combination.