DOI: 10.1595/147106709X465163

NEW PATENTS

CATALYSIS – APPLIED AND PHYSICAL ASPECTS

Palladium-Zinc Nanocolloidal Particles

MITSUBISHI CHEM. CORP. *Japanese Appl.* 2008-264,761

A method for manufacturing PdZn nanocolloidal particles of formula $Pd_{(100-x)}Zn_x$ where $30 \le x \le 80$ is described. Compounds of Pd and Zn are mixed with a ligating organic compound, a reducing agent and a solvent and heated. Particles 1–50 nm in diameter are formed with a thin organic layer on the surface preventing coalescence, and can be used as-is in a liquid carrier or dispersed on a support such as silica gel to catalyse the dehydrogenation of alcohols.

CATALYSIS – INDUSTRIAL PROCESS

Palladium on Bacterial Cellulose Support

INDIAN INST. TECHNOL. *World Appl.* 2008/122,987

A novel design for a reactor using immobilised Pd is proposed. Metallic Pd is deposited on a support of bacterial cellulose coated on a series of acrylic discs. These are rotated, alternately allowing $H_{2(g)}$ to be adsorbed from a gaseous feed and to reduce chlorinated pollutants or nitroaromatic compounds in the liquid feed. The method can be used for treatment of wastewater and decolourisation of textile dyes.

CATALYSIS – REACTIONS

Production of Chiral β-Amino Acid Derivatives

SOLVIAS AG *U.S. Patent* 7,495,123

The claimed process bypasses the need for synthesis of a protected β-amino acrylic acid substrate as an intermediate. It is catalysed by a Rh complex with chiral phosphine ligands, which may be either preformed or generated *in situ* through the addition of the Rh metal precursor and ligand to the reaction mixture.

Palladium-Catalysed Aryl Cross-Coupling

A. S. IONKIN *U.S. Appl.* 2009/0,054,650

A new catalytic method for the coupling of aryl moieties is claimed. A hetero aryl halide is reacted with an arylboronic acid in the presence of a Pd compound in combination with a compound containing a dialkylphosphine moiety. The Pd compound may include $PdCl_2(dppf)$, $Pd(OAc)_2$, $Pd(PPh_3)_4$ or $Pd_2(dba)_3$. The dialkylphosphine may be di-*tert*-butylphosphine or diadamantylphosphine.

Ruthenium-Catalysed Direct Synthesis of Amides

D. MILSTEIN *et al.* *U.S. Appl.* 2009/0,112,005

A novel process for preparation of amides from alcohols and amines is claimed, catalysed by a Ru complex based either on a dearomatised PNN-type ligand (where PNN = 2-(di-*tert*-butylphosphinomethyl)-6-(diethylaminomethyl)pyridine), or its precursors. A primary amine is directly acylated by an equimolar amount of a primary alcohol to produce the desired amide with H_2 as the only byproduct. High yields and turnover numbers are claimed.

EMISSIONS CONTROL

NOx Reduction Catalyst for FCC

G. YALURIS *et al.* *U.S. Appl.* 2009/0,045,101

A catalytic additive for reduction of NOx produced in the catalyst regeneration zone in full-burn fluid catalytic cracking (FCC) processes is described, based on a mixture of: (a) a zeolite-free acidic metal oxide, (b) an alkali/ alkaline-earth metal, (c) an oxygen storage component, (d) Pd (preferably 40–1500 ppm) and (e) a pgm, preferably Pt, Rh and/or Ir (preferably 25–1500 ppm). Amounts added to the circulating FCC mixture are preferably 0.1–20 wt.% of the cracking catalyst.

Porous Platinum-Alumina Cryogel Catalyst

NATL. INST. ADV. IND. SCI. TECHNOL. *Japanese Appl.* 2009-018,225

A manufacturing method for a highly-porous and durable catalyst for the treatment of VOCs in industrial exhaust gas is described. A chelated solution of Pt with ammonium oxalate is added to a sol prepared from AlO(OH). Gelling is induced by addition of urea and the gel is freeze-dried and calcined. Pt constitutes 0.5–5 wt.% of the catalyst body in the form of highly-dispersed ultrafine particles.

FUEL CELLS

Platinum Nanostructures for PEMFC Catalysts

TOYOTA ENG. MANUF. NORTH AMER. INC *World Appl.* 2008/051,284

Dendritic nanostructures containing Pt or Pt alloys are claimed for use in fuel cell catalysts. The dendrimers may be spherical with a diameter of 1–1000 nm (preferably 5–100 nm), or disc-shaped with a thickness of ~ 1–10 nm and may be partially fused. Preparation occurs in a fluid medium containing a reducing agent, a precursor such as a Pt complex and a matrix on which the structures are grown and which can be used to manipulate their shape.

$RuTe_2$ Catalyst for Fuel Cell

MITSUBISHI CHEM. CORP *Japanese Appl.* 2008-287,927

A $RuTe_2$-based catalyst which is stable enough for use in both the cathode and anode in a PEMFC is claimed. The stability is obtained through use of a N-containing Ru precursor, preferably $Ru(NO)(NO_3)_3$. The catalyst can be used as a coating on a C-based support and can form part of a MEA or MEA stack.

METALLURGY AND MATERIALS

Ni-Ti-Pt Shape Memory Alloy

U.S. ADM. NASA *U.S. Patent* 7,501,032

A Ni-Ti-Pt shape memory alloy with a maximum work output of ≥ 5 J cm^{-3} (preferably 10–15 J cm^{-3}) is disclosed. The transition temperature is 100–400ºC, preferably 200–350ºC, and the hysteresis is < 50ºC, preferably 10–20ºC. The composition is (in at.%): 50–52 Ti (preferably 50–50.5), 10–25 Pt (preferably 15–23) and the balance Ni, which may be partially substituted by 0.5–2 C and < 5 of one or more of Pd, Au and Cu.

Device for Manufacturing Glass Fibre

TANAKA KIKINZOKU KOGYO KK *Japanese Appl.* 2008-266,057

Molten glass flows from a circulating stream through a cylindrical bushing block (1), is filtered through a screen (2) and is then extruded through a number of nozzles mounted in a base plate (3). (2) and (3) are composed of Pt or a RhPt (Rh = 5–20 wt.%) alloy and the interior of (1) is coated in a protective layer of the same material. (1) and (3) are electrically heated at 10 A mm^{-2} to prevent spot cooling of the molten glass.

APPARATUS AND TECHNIQUE

Platinum-Modified Pollen Filter

A. J. OSINGA *World Appl.* 2009/048,324

A Si-based coating modified by adding ~ 5 ppm Pt is claimed to be effective to filter pollen and other allergens from the air. An emulsion of a siloxane complex of Pt catalyst with an average particle size of ~ 0.2 μm is added to a water-based silicone emulsion and held at quiescence for one day to form crosslinked silicone particles. The coating is applied to a gauze screen to form the filter.

Iridium Single-Atom Tip

ACADEMIA SINICA *U.S. Appl.* 2009/0,110,951

A method for preparing an Ir tip of atomic sharpness is described. An Ir rod with a polycrystalline or <210> monocrystalline structure is sharpened by a method such as electrochemical etching to a tapered end of radius 5–200 nm and heated in a vacuum chamber under O_2 pressure 10^{-8}–10^{-5} Torr in two stages, to form a tip terminating in a single atom. The tip is stable, regenerable, capable of sustaining electric fields up to ~ 53 V nm^{-1} and a perfect point electron source.

Palladium-Based Thin Film

SUMITOMO METAL MINING CO LTD *Japanese Appl.* 2008-279,329

A H_2-permeable membrane is obtained by sputter deposition of Pd or Pd alloy on a glass-type substrate possessing a thermal expansion coefficient of 8–15 × 10^{-6} °C^{-1}. A metal substrate layer which may be Cu can be deposited between the substrate and film and dissolved by acid to exfoliate the film. A very thin membrane (0.1–5 μm thick) is obtained which is relatively defect-free and exhibits minimal curling.

BIOMEDICAL AND DENTAL

Platinum Complexes for Treatment of Tumours

UNIV. WARSZAWSKI *World Appl.* 2009/041,841

Novel peptide-Pt complexes are described, which typically have the formula (OP-AA)-PtX_2, where OP is an opioid peptide, AA is an amino acid residue of methionine, cysteine, histidine, 1,3-diaminebutanoic acid or 1,4-diaminepentanoic acid and X is a halogen, preferably Cl. The complexes are claimed to combine the anticancer properties of Pt with the analgesic activity of the peptide.

Dental Alloy with High Palladium Content

ARGEN CORP *World Appl.* 2009/046,260

A Ni-based dental alloy with a high Pd content is disclosed. The composition is (in wt.%): 25–45 Pd (preferably ~ 25), 15–30 Cr (preferably ~ 25) and at least 5 wt.% Mo and/or W (preferably 12), with the balance being Ni. Optionally the Ni may be partially substituted by up to 1.5 wt.% Si and up to 10 wt.% Re, Nb and/or Ta. The addition of Pd makes for an alloy which can be easily cast, ground and bonded to porcelain, and where the thermal expansion is well-matched to that of porcelain.

Iridium Complex for Detection of Cancer

GUNMA UNIV. *Japanese Appl.* 2008-281,467

The novel application of electroluminescent compounds of Ir to the measurement of O_2 concentration in living cells is described. Complexes of Ir(III) with aromatic ligands, preferably containing N, S or O, and specifically $BTP_2Ir(acac)$ (1) are indicated. When applied to tissue, and using a suitable detection method, (1) will emit red phosphoresence in the absence of dissolved O_2. (1) can be used for the detection and imaging of cancer and has the advantage of being non-invasive.

Iridium Oxide Conductive Coating for Medical Device

MEDTRONIC INC *U.S. Appl.* 2009/0,047,413

Disclosed is a coating applied to the housing of implantable medical devices, especially those housing powered components. It includes a carrier and 0.1–90 wt.% of a therapeutic agent, specifically Ag nanoparticles. The conductive carrier can be Ir oxide, Pt, Pt black, graphite or other forms of C, etc. Such coatings containing Ir oxide are described to be effective at inhibiting bacterial growth.

ELECTRICAL AND ELECTRONICS

FeRh AFM-FM Phase Change Material for PMR

HEADWAY TECHNOL. INC *U.S. Appl.* 2009/0,052,092

A perpendicular magnetic recording (PMR) head is described which contains an antiferromagnetic-ferromagnetic (AFM-FM) phase change material in the main pole layer, which may be FeRh or FeRhX where X = Pd, Pt or Ir and where Rh is > 35 at.% of the total. During non-write operations the material is in an AFM state to minimise remanence, and during write operations it is switched to an FM state by heating. Minimal pole erasure during non-writing and high writability compared to single pole writers is claimed.

SURFACE COATINGS

RhAl Overlay Coatings for Gas Turbine Components

GENERAL ELECTRIC *U.S. Appl.* 2009/0,061,086

A RhAl coating system is claimed, consisting of: 25–90 at.% Rh, 10–60 at.% Al and forming predominately a B2-phase RhAl intermetallic. It may also contain up to 25 at.% of one or more of Pt, Pd, Ru and Ir and up to 20 at.% of the base metal and alloying elements of the substrate. It may be applied as an environmental coating or a diffusion barrier coating.