NEW PATENTS

ELECTROCHEMISTRY

Electrode for Electrolysing Metallic Electrolyte

TDK CORP. *Japanese Appl.* 6/122,988

An electrolytic electrode comprises a layer of Ir oxide and Ta oxide containing 75–95 at.% Ir and 5–25 at.% Ta on a conductive substrate and a glue or thiourea component. The process is applied to electrodes used in the electrolysis of a metallic electrolyte containing organic hydrophilic compound for producing O_2 at an anode. The electrode has excellent durability and low O_2 overvoltage.

Electrode for Electrolysis of Drinking Water

TDK CORP. *Japanese Appl.* 6/158,378

The electrode comprises a conductive base coated with Pt metal and oxidised Ta containing 30–99 mol% Pt and 1–70 mol% Ta. The coating preferably also contains 40 mol% Ir metal. The electrode is used as the anode of an ion water generator, and provides high voltage polarity inverse electrolysis for long periods.

Electrode for Cold Fusion Reaction

OSAKA GAS CO. LTD. *Japanese Appl.* 6/160,559

The Pd electrode is partially covered with material of lower H gas generation activity than Pd, such as Zn, Cd, Ni, or Hg, by electrocrystallisation or vapour deposition. The electrolysis of heavy H_2O under constant current density, with the Pd electrode results in the efficient diffusion of heavy H into the electrode which increases the heavy H:Pd ratio and thus increases heat generation based on nuclear fusion.

Production of Alkylurea Compounds

MITSUBISHI GAS CHEM. CO. INC.

Japanese Appl. 6/173,056

An alkylurea compound is produced electrolytically from CO and an alkylamine using a cathode containing a Pt group element. The alkylamine is preferably a primary or a secondary aliphatic amine with 1–8C atoms, and the solvent has an oxidation potential lower than that of the starting alkylamine. The supporting electrolyte is I ions and is added 0.1–20 wt.% with respect to the starting amine. The process is carried out under mild manufacturing conditions without using an oxidising agent and without producing any by-products, such as H_2O.

Simultaneous Electrolytic Production of Carbonate Ester and Formate Ester

MITSUBISHI GAS CHEM. CO. INC.

Japanese Appl. 6/173,057

A carbonate ester and a formate ester are manufactured simultaneously from CO and alcohol using a cathode containing a Pt group metal, with alkali metal halide as the supporting electrolyte. The electrolysis is performed at 0–100°C at a current density of 1–20 A/dm^2. The electrolytic cell is partition-free and uses a capillary gap cell. The carbonate ester is a starting material for polycarbonate resin and alkylating agents.

Power-Saving Gas Electrode Structure for Electrolysis

DE NORA PERMELEC S.p.A. *Japanese Appl.* 6/173,061

The electrode comprises an ion-exchange resin base with a thin layer of a conductive C having a Pt group metal or oxide as electrode catalyst, and a porous collector in close contact with the side opposite to that having the ion exchange membrane and metal. This power-saving electrode structure is used in the cathodic chamber of an electrolytic cell, with the porous side alone being in contact with the electrolytic solution for electrolysis.

Noble Metal Coated Metallic Electrode

DENBO KOGYO K.K. *Japanese Appl.* 6/192,871

The production comprises coating Ti or stainless steel with a Pt group metal of Pt, Pd or Ir, or Au; followed by pressure welding these components together. The electrode is used in the electrolysis of H_2O or various types of aqueous solution. A simple compression roll is used in the processing method. A longer service life than conventional electrodes is claimed.

Production of Electrode for Electrolysis

PERMELEC ELECTRODE LTD.

Japanese Appl. 6/192,872

An electrode is prepared by firing the precipitate co-deposited by alkali from an aqueous solution containing Pt group metal and at least one Group IV or Group V element, mixing the fired particles with a binder and applying the mixture onto an ion exchange membrane. In an example, co-deposited precipitates of $IrCl_3$ and $TaCl_5$ were prepared. The electrode has a low electrolysis voltage with long life.

Electrode for Electrolysis of Aqueous Solutions

NITTETSU HARD K.K. *Japanese Appl.* 6/200,391

The electrode is formed from a primary layer on a valve metal base, with the valve metal being different to that used for electrical discharge machining, followed by forming a surface layer by plating a Pt group metal or alloy on the primary layer. Aqueous solutions are electrolysed using the electrode. The electrode is suitable as the one at which O_2 is generated.

High Durability Anodes

FURUKAWA ELECTRIC CO. LTD.

Japanese Appls. 6/248,484–85

High durability anodes for electrolytic operations and O_2 generation comprise metal (alloy) base, a diffusion N-containing layer and a Pt group metal oxide layer; or a metals(alloy) base, a nitride layer, a layer of oxide of an element other than Pt group metal, such as Ti, and a catalyst layer containing Pt group metal. The N-containing layer is treated to remove its top surface, followed by dipping in catalyst solution containing $IrCl_3$ for a catalyst coating. The electrode can operate in H_2SO_4 at a current density of 100 A/dm^2 and a terminal voltage >10 V can be sustained for > 910 h.

ELECTRODEPOSITION AND SURFACE COATINGS

Rosy Pink Coloured Coating

ETA FAB. EBAUCHES S.A. *European Appl.* 603,673A

A rosy pink coating is made up of a nitride coating of Ti, Zr, Hf or a mixture, and Al, C or Group Vb and VIb element, with a second coating of Pd and In. The process is used for coating jewellery, glasses and clocks, giving better clarity of coloration.

Palladium and Platinum Colloidal Dispersion

MINNESOTA MINING & MFG. CO. *U.S. Patent* 5,332,646

The process comprises reducing organo-metallic Pd and/or Pt salts in a dispersing medium at 0.001–2(0.005–1) wt.%. The Pd and/or Pt colloidal dispersion produced is useful as a metallic toner fluid, for electrophoretic deposition to form a non-conductive metal coating and for electroless plating. Process requires only mild conditions, allowing easy control of the concentration of particles formed.

An Anode for Electroplating Sheet Steel

DAISO CO. LTD. *Japanese Appl.* 6/146,047

The anode is produced by sputtering, ion plating and/or vacuum deposition of a layer of SiO_2 and Ta on a metallic base and forming an active layer by pyrolysis of a salt of Ir and Ta. The process results in an insoluble anode used for electrolytic processes with accompanying O_2 generation, and is used particularly in electroplating sheet steel with Sn, Zn and Cr.

Ruthenium Plating Solution

JAPAN ENERGY K.K. *Japanese Appls.* 6/146,054–56

A Ru plating solution comprises an inorganic acid salt of Ru, sulphamic acid and/or sulphuric acid as stabiliser and a halogen element, added in the form of NH_4 halide or an alkali metal halide. The Ru plating solution has high stability and a high rate of electrodeposition. High quality plating of ≥ 5 μm in thickness is obtained.

Platinum Plating Solutions

SEIKO INSTR. INC. *Japanese Appl.* 6/146,057

A Pt plating solution giving a mirror-finished surface, contains 1–30 g/l Pt, 10–200 g/l of a sulphate, 0.5–10 g/l of a sulphite, and Na or K as an alkali metal, with the pH being controlled to ≤ 2. The Pt plating, on top of a Au strike layer, finally coated with Au, provides a white coloured article, has low stress and high adhesion strength to the base.

Stable Palladium Alloy Plating Baths

BISO JAPAN K.K. *Japanese Appls.* 6/146,058–59

A Pd-In alloy plating bath comprises 10–200 g/l of a carboxylic acid, 1–200 g/l of a sulphate or sulphite, 1–50 g/l Pd in the form of a Pd salt, 0.1–30 g/l In, at pH 6–11 and gives black-coloured plating. A Pd-Co-In alloy plating bath provides a white to pale grey plating. The Pd salt is selected from dichlorotetraamine Pd, Pd(I) chloride, etc. The bath is stable and colour tone is controlled by changing the Pd:In content.

High Speed Rhodium Plating Process

JAPAN ENERGY K.K. *Japanese Appl.* 6/173,071

The plating process produces a crack-free bright thick Rh film by using a low stress Rh electroplating solution comprising a Rh salt, free acid, and S or a S-containing substance, by spraying the solution against the article to be plated. Preferably, the plating bath contains 8–12 g/l Rh, 70–90 g/l H_2SO_4, at 50–70°C, 20–40 A/dm^2 and has a spray rate of 0.3–1.0 m/s. Process provides a low stress Rh plating at high speed.

Anti-Oxidising Metallic Component

ASAHI GLASS CO. LTD. *Japanese Appl.* 6/184,789

An anti-oxidising metallic component comprises an oxidising metal coated with a composition containing 0–35% Pt, 0–60% Pd, 30–99.5% Ag, 0.5–70% Au and 0.0001–0.01 wt.% of Group IIIB element, but not B or Al. The coating component is suitable for use in lead pins of semiconductor packages and can be treated by heating in air.

Electroless Colouring of Aluminium Alloy

PENTEL K.K. *Japanese Appl.* 6/184,792

Electroless colouring of Al or Al alloy comprises anodising Al alloy, treating with silane coupler, dipping in Pd complex salt, followed by electroless plating to deposit metal on the anodised film for colouring. Uniform colouring is obtained while maintaining film adhesiveness, weatherability and corrosion resistance.

Manufacture of Electroless Plated Material

NIPPON VILENE K.K. *Japanese Appl.* 6/212,439

Electroless plated material is made in a catalyst holding process by electroless plating by carrying a complex of PVA resin and 0.004–0.05 mol%/monomer unit of the resin of a Pd salt on a matrix, followed by heat treatment at 110–160°C. The process continuously plates electrolessly, without eluting the Pd metal ions, when the matrix is dipped into the plating bath.

Palladium Surface Coatings

ATOTECH DEUT. G.m.b.H. *German Appl.* 4,316,679

Cu, Ni and their alloys are surface coated with Pd by deposition from an acidic, case-hardening bath containing a Pd salt and an oxidising agent; Pd is deposited from a HCHO-free bath containing a Pd salt, and a nitrogenous complex-forming substance and methanoic acid. The process is used for printed circuit boards and corrosion-resistant coatings, giving adhesive, bright, thin, low-porosity Pd coatings.

APPARATUS AND TECHNIQUE

Electrochemical Gas Sensor

MATSUSHITA ELECTRIC WORKS LTD. *Japanese Appl.* 6/160,349

An electrochemical gas sensor comprises counter and reference Pt electrodes on a substrate of Al_2O_3, Al nitride, Si, an epoxy or phenolic resin; with an ion conductive solid electrolyte film covering the electrodes and a gas diffusion working electrode. The sensor maintains its sensitivity and is used for detecting CO_2, CO, H_2, alcohol or NOx.

Apparatus for Liquid Phase Epitaxial Growth

MURATA MFG. CO. LTD. *Japanese Appl.* 6/206,793

A magnetic-garnet monocrystalline thin film is grown over a substrate plate surface using apparatus in which the crucible and holder for the substrate plate are made of Pt mixed with ZrO_2 powder and Au. The specified material is resistant to corrosion by the PbO-base flux, and permits the manufacture of good quality monocrystalline garnet films.

Lithium Tantalate Single Crystal

SHINETSU CHEM. IND. CO. LTD. *Japanese Appl.* 6/234,597

The Ir and Rh contents of Li tantalate single crystals are ≤ 1 ppm so that absorption at wavelengths 400–500 nm is eliminated. The Li tantalate is an excellent material for second harmonic generation. The crystal is prepared by the Czochralski method using an Ir crucible having an after-heater of Rh-free noble metal or Ir, for the parts where the temperature would allow Rh evaporation. When inert gas having an O_2 concentration of 0.2–1.5 vol.% is used, colouring by O_2 deficiency is eliminated.

JOINING

Alloy for Solder to Connect Electronic Component and Wiring Board

WORLD METAL CO. LTD. *World Appl.* 94/18,350A

An alloy to be plated for solder connecting electronic components to wiring boards comprises Pd-Sn-Pb alloy. If the alloy further contains P or B, the drop in solderability of the alloy due to heat is reduced. When In is included, the melting point of the alloy can be lowered, and when it contains Ag, leaching can be reduced. This alloy to be plated is preferably formed by electrolytic or electroless plating.

High Strength Solder Joint Structure

TOKAI RIKA DENKI K.K. *Japanese Appl.* 6/169,160

A method to form a high strength solder joint comprises forming a Pt and Ag conductor, containing 0.8 wt.% Pt, on a substrate, and further applying a Sn and Ag solder layer onto the conductor. A preferred solder joint structure is obtained by screen printing a circuit pattern and is used in hybrid ICs. High joint strength is obtained and can be maintained during repeated heating cycles.

HETEROGENEOUS CATALYSIS

Reduction Catalyst for Nitrogen Oxides

AGENCY OF IND. SCI. & TECHNOLOGY *European Appl.* 602,602A

A catalyst for reduction of NOx using a HC as a reducing agent, such as CH_4, pentane, gasoline, C_2H_4, etc., contains Pt, Ir, Rh and/or Ru, and 0.01–10 pts. wt. Au with respect to 100 pts. wt. of Pt or Ir, and can further contain Ce, La, Nd, Ge or Ga oxide on a support of Al_2O_3, SiO_2, etc. The catalyst has high durability and does not require large amounts of HC reducing agent. The process temperature is 100–800°C.

Palladium-Containing Metal Oxide Catalyst

JOHNSON MATTHEY PLC *European Appl.* 602,864A

A catalyst used in oxidative reactions, particularly in sensors to indicate the presence of hazardous gas, is prepared by co-precipitation of Pd particles and metal oxide particles, such as Fe(III) oxide, Bi molybdate, Ce(IV) oxide and Sb oxide. The catalyst is used in car exhaust systems to measure catalyst performance. The operating temperature of the reaction is reduced, and reactions can be performed at ambient temperature. The catalyst does not require further activation by calcination.

Catalytic Reforming of Naphtha

EXXON RES. & ENG. CO. *European Appl.* 606,007A

A naphtha feedstream is catalytically reformed to give an improved 5C+ liquid yield in a series of reactors or reaction zones, in which one lead reactor or zone contains 0.1–1 wt.% Pt and 0.01–0.1 wt.% Re/inorganic oxide; and one tail reactor or zone contains 0.1–1 wt.% Pt, 0.1–1 wt.% Ir and 0.02–0.4 wt.% Sn, uniformly dispersed throughout a particulate solid support. The catalyst improves octane quality. It has high activity and selectivity in reforming feedstreams.

Aromatic Olefin Preparation

HOECHST A.G. *European Appl.* 606,057A

Aromatic olefins are prepared from aryldiazonium salt and olefin in the presence of a heterogeneous Pd catalyst in an organic solvent at –20 to 150°C. The method is generally applicable, and gives a high olefin yield without any impurities. The catalyst is stable and can be easily recovered.

Selective Hydrogenation of 4-Substituted Benzaldehydes

DEGUSSA A.G. *European Appl.* 606,072A

The process for the selective catalytic hydrogenation of the carbonyl group in aromatic aldehydes to the corresponding alcohols and methyl compounds comprises hydrogenation in the presence of a catalyst containing 0.01–3 wt.% Pt, Pd or Rh on a TiO_2 support. The catalyst is in pellet form 1–10 mm in diameter and has a fracture resistance of > 40 N. The process is useful for the production of benzyl ethers.

Aqueous Quaternary Ammonium Hydroxide

MITSUBISHI GAS CHEM. CO. INC. *European Appl.* 608,545A

A high purity aqueous quaternary NH_4OH (I) is produced by reacting quaternary NH_4 organic acid salt with H_2O_2, O or an O-containing gas in the presence of a Pt group metal catalyst, preferably Pd, Pt, Ru, Rh or Ir, supported on C, SiO_2 or Al_2O_3. (I) is used as a developing agent for resists for LSIs and LCDs.

Platinum Recovery Catchment Gauze

JOHNSON MATTHEY PLC *European Appl.* 611,041A

A catchment gauze for Pt recovery from the NH_3 oxidation process, which uses a Pt-based catalyst, is formed from fibres of Pd-Co alloy containing ≥ 70 wt.% Pd. NOx emission is reduced. The knitted gauze may be one of a pack of other gauzes of Pd-Co alloys, pure Pd, Pd alloys with other metals, or of ceramics.

Hydrogenation Catalyst

KEMIRA OY. *European Appl.* 611,126A

A catalyst for H_2O_2 manufacture by hydrogenation of anthraquinone in an organic solvent comprises finely divided particles of a Pt group metal containing ≥ 50% Pd and a transition metal, and contains finely grained suspensible metal particles. The inclusion of the transition metal gives a durable catalyst which maintains high activity for longer periods, thus reducing regeneration requirements.

Catalysts for Purification of Automotive Exhaust Gases

CATALER IND. CO. LTD. *European Appl.* 613,714A

A catalyst for purification of exhaust gases at lean operation comprises a porous support which is loaded with Pd and/or Pt as first ingredient and with at least two other ingredients selected from rare earths, La, alkali metals, alkaline earths, Fe, Ni, Co, Mn and Ba. The catalyst is used for simultaneously purifying CO, HC and N oxides in O-rich exhaust gases.

Catalyst for NOx Denitrisation

SAKAI CHEM. IND. CO. LTD. *European Appl.* 614,692A

A catalyst for selective denitrising NOx using HC as a reducing agent comprises a substituted zeolite containing 0.1–20 wt.% Ti, Zr, and/or Sr ion and alkali metal, alkaline earth metal or H; and Pd, Pt, Ru, Rh or Ag metal, or at least one oxide of V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Nb, etc. A method for catalytic denitrising NOx in the presence of a HC, even with O_2 present, using the above catalyst is also claimed.

A Catalyst for Dehydrogenation Reactions

EXXON RES. & ENG. CO. *European Appl.* 614,698A

A catalyst composition comprises an alloy of a Pt group metal and Zn or Ga on a support, such as Zn or Ga modified SiO_2-pillared clays, respectively, etc. The catalyst is used in dehydrogenation reactions and also in hydrogenation of olefins. The catalyst maintains high activity and selectivity for at least five days.

Dehydrogenating Light Hydrocarbon Feed

CHEVRON RES. & TECHNOLOGY CO. *World Appl.* 94/13,605A

Light paraffinic hydrocarbon feed is dehydrogenated in a reaction zone which may be subjected to periodic exposure to > 100 ppb S, by contact with a catalyst of Pt or Pd; an intermediate pore SiO_2:Al_2O_3 zeolite of mole ratio ≥ 30; and an alkali; the molar ratio alkali:Al in the zeolite is 1–5. The alkali content of the catalyst is very important for high activity and selectivity to olefins, and low deactivation or fouling rates. The catalyst is S resistant up to 2 ppm S.

Exhaust Gas Cleaning Catalyst

MITSUBISHI JUKOGYO K.K. *World Appl.* 94/19,103A

An exhaust gas cleaning catalyst, with a special X-ray diffraction pattern, comprises at least one Pt group metal and also at least one of Ti, Zr, Cr, etc, supported on a layer-complex crystalline silicate. The catalyst is used in cars with lean-burn petroleum and diesel engines, has excellent durability and denitrification performance.

Catalyst for Hydrocarbon Hydrogenation

AMOCO CORP. *World Appl.* 94/19,429A

The catalyst (I) suitable for the hydrogenation of a HC feedstock comprises 0.1–2.0 wt.% each of Pd and Pt on a zeolite β support containing a specified Na content which improves the hydrogenation, aromatic saturation, desulphurisation, denitrogenation and cetane number. Feedstock volume can be expanded. A feedstock of HC boiling at 150–700°C and atmospheric pressure can be hydrogenated by contact with H and (I).

Preparation of Ethyl Acetate

STANDARD OIL CO. OHIO *U.S. Patent* 5,334,751

EtOAc is prepared by reaction of EtOH and O_2 in the presence of a solid Pd catalyst containing crystalline TiP_2O_7 of formula $Pd_aM_bTiP_cO_x$ where M = Cd, Au, Zn, Tl or alkali(ne earth) metal; a = 0.0005–0.2; b = 0.3 a; c = 0.5–2.5; x is to satisfy the valence. The crystalline TiP_2O_7 is an effective and mechanically tough support for the Pd component of the catalyst, and also contributes to the catalytic activity.

Preparation of Vinyl Acetate

QUANTUM CHEM. CORP. *U.S. Patent* 5,336,802

Vinyl acetate is prepared by passing C_2H_4, HOAc and O_2 over a Pd-Au catalyst which was pretreated by heating in the presence of an oxidising then a reducing agent. The catalyst shows improved initial selectivity to vinyl acetate, while maintaining high conversion. The frequency of regeneration or replacement of the catalyst is reduced.

Fluorocarbon Ion Exchange Membrane

UNITED TECHNOLOGIES CORP. *U.S. Patent* 5,342,494

A catalytic fluorocarbon ion exchange membrane is manufactured by repeatedly exchanging H ions in the membrane with replacement cations, exchanging these with Pt ions and reducing these ions to Pt metal. Any remaining replacement cations are exchanged with H. The membrane is equilibrated, Pt metal being present as discrete particles. The membrane is used to produce consistently high purity O_2 and H_2.

Alkenyl Alkanoate Production

UNION CARBIDE CHEM. & PLASTICS TECHNOL. *U.S. Patent* 5,342,987

Alkenyl alkanoates are prepared by reaction of an alkene, an alkanoic acid and O_2-containing gas in the presence of a Pd-Au catalyst, on a low-Na content support, and a K promoter. The conventionally prepared impregnated support particles are washed with a cation exchange solution to reduce the Na content which thus increases the activity of the catalyst.

Dehydrogenation Catalyst

PHILLIPS PETROLEUM CO. *U.S. Patent* 5,344,805

A dehydrogenation catalyst is prepared by impregnating a Zn aluminate support with Pt and Sn from an impregnation solution containing H_2O, a Pt compound and oxalic acid, and H_2O, a Sn compound and an inorganic acid solution. The catalyst has improved performance for alkane dehydrogenation with respect to activity, selectivity and deactivation.

Co-production of Di-Tertiary-Butyl Alcohol and Tertiary-Butyl Alcohol

TEXACO CHEM. CO. *U.S. Patent* 5,345,009

A tertiary-butyl hydroperoxide (TBHP) charge stock containing a solution of TBHP in tertiary-butyl alcohol (TBA) is contacted with 0.1–1 wt.% Pd catalyst supported on pelleted C to co-produce and recover TBA and di-tertiary-butyl peroxide (DTBP) from the hydroperoxide decomposition products. The reaction is carried out at 40–160°C and 0–10,000 psig pressure. DTBP is useful as a high temperature free radical initiator in chemical reactions. The method gives four times higher DTBP yields than are obtained for conventional Pd/Al_2O_3 catalysts.

Catalyst for Purifying Nitrogen Oxides

SUMITOMO METAL MINING CO. *Japanese Appl.* 6/126,172

A catalyst of Pt and Ir on a high specific surface area support has 0.01–5 wt.% Pt and 0.01–5 wt.% Ir, with an Ir:Pt atomic ratio of 0.1–1. The catalyst can purify NOx over a wide temperature range even for atmospheric exhaust gas containing excess O_2 and at a lean air:fuel ratio. Changing the Ir:Pt ratio sets the Pt-Ir catalyst active temperature region to a desired range in the NOx-hydrocarbon selective reduction reaction.

Catalysts for Purifying Exhaust Gas

ZH. NIPPON JIDOSHA DENKYUSHO *Japanese Appl.* 6/126,173

The catalyst consists of multistage catalyst layers of (a) Pd, Pt or Rh (0.3–10 g/l) on γ-Al_2O_3 substrate on an acid-resistant three-dimensional ceramic honeycomb and (b) a lanthanide-based catalyst such as La, Nd or Pr, and (c) Mg oxide catalyst. The catalyst can be used for purifying exhaust gas released from a natural gas engine. It reduces formaldehyde production.

High Frequency Exothermic Material

MATSUSHITA DENKI SANGYO K.K. *Japanese Appl.* 6/126,190

An exothermic material having catalytic ability, for rapid auto catalyst warm-up, consists of a ceramic support, coated with a high frequency absorber, such as a semiconductor, microparticles and a catalyst containing at least one of Pt, Rh and Pd, or at least one metal oxide of Cu, Mn, Co and Fe. The exothermic material generates heat by absorption of high frequency and decomposes HC and CO in the exhaust gas of automobiles.

Decomposition Catalyst for Nitrogen Oxides

SAKAI KAGAKU KOGYO K.K. *Japanese Appls.* 6/142,509–510

A decomposition catalyst for N suboxide is composed of Ru, Rh, Re, Os or Ir supported on α-Al_2O_3 (1), or is composed of Ru/Ir (mole ratio = 0.3–5.0) on a hydrophobic support (2). Catalyst (1) shows high activity at low temperature and under a moist atmosphere. In an example, activated Al_2O_3 was immersed in ethanol solution containing Ru/Ir, dried at 100°C for 2 h, burned at 400°C for 5 h, and reduced with H_2 at 400°C for 2 h to form catalyst (2) supporting 1.5% Ru/Ir. Catalyst (2) is highly active and stable.

Nitrogen Oxide Decomposing Catalyst

SUMITOMO METAL MINING CO. *Japanese Appl.* 6/154,602

A NOx decomposing catalyst consists of an inorganic oxide support loaded with Pt in which acidic anions, preferably SO_4^{2-} or Cl remain after firing. The catalyst is used to remove NOx from combustion exhaust discharged under fuel-lean conditions and which contains excess O_2. NOx is reduced selectively to N_2 and so the amount of by-product N_2O is minimised.

Nitrous Oxide Decomposition Catalyst

SAKAI KAGAKU KOGYO K.K. *Japanese Appls.* 6/154,603–604

A N_2O decomposition catalyst consists of a hydrophobic support loaded with Ir and at least one component selected from Nb_2O_5, TiO_2 or ZrO_2, or La_2O_3, CeO_2, Pr_2O_3, etc. The catalyst decomposes N_2O contained in the waste gas discharged from factories, car engines, garbage or sewage incinerators, etc. It provides a higher decomposition efficiency and a longer operating life.

Dualistic Alumina Carrying Platinum Catalyst

CHISSO CORP. *Japanese Appl.* 6/165,936

Dualistic Pt/Al_2O_3 catalyst for dehydrogenation and alkylation includes no surface hydroxyl group by burning the Al_2O_3 at ≥ 923 K in Cl_2 gas. The Al_2O_3 is carried with Pt chloride by CVD at 623–873 K to produce Pt/Al_2O_3. The catalyst has a dual function as a solid Lewis ultra strong acid and as a Pt metal. It has high catalytic activity for alkylation of aromatic compounds by paraffin and for dehydrogenation of cyclohexane.

Removal of Nitrogen Oxide from I.C.E.

NIPPON SHOKUBAI CO. LTD. *Japanese Appl.* 6/165,937

A catalyst for NOx removal contains Ir, fire resistant inorganic oxide, such as Al_2O_3, and a metal, which is at least one of Ta, Nb, Y or rare earth. The catalytic active matter is coated onto the structure body, and exhaust gas for NOx removal is passed, in an oxidising atmosphere, through the catalyst in the presence of hydrocarbon. NOx from the exhaust gas of gasoline or diesel engines, or boiler industry plant is removed. The added metal improves the high temperature thermal resistance of the catalyst.

Noble Metal Loaded Anion Exchange Fibre

NICHIBI K.K. *Japanese Appl.* 6/170,236

A new anion exchange fibre, made of polyvinylalcohol fibre containing primary, secondary, tertiary or quaternary ammonium groups, is loaded with 0.1–20 wt.% of Pt, Pd, Rh or Ir. The fibre is used as a catalyst to replace conventional Al_2O_3, SiO_2, TiO_2 or zeolite catalyst, and has a higher catalytic activity. It is easier to handle than organic polymer granule catalysts.

Preparation of Hexafluoropropanol

CENTRAL GLASS CO. LTD. *Japanese Appl.* 6/184,025

1,1,1,3,3,3-Hexafluoropropan-2-ol (HFIP) is prepared in high purity by hydrogenolysis of hexafluoroacetone hydrate with H_2 in the presence of Pd and Ru mixed catalysts, preferably Pd/Al_2O_3 and Ru/Al_2O_3, at 40–150°C and a H_2 pressure of 1–30 kg/cm^2.

Palladium Catalyst Production

NIKKO SC. K.K. *Japanese Appl.* 6/190,277

The catalyst is produced by addition of aqueous solution of Na silicate to $PdCl_2$ to deposit Pd hydroxide on the surface of a support, such as C or Al_2O_3; the Pd hydroxide is then reduced. The Pd catalyst has a higher activity, is hardly sintered and is used for hydrogenative reduction of nitrobenzene to aniline.

Efficient Catalyst for Burning Hydrocarbons

TOKYO GAS CO. LTD. *Japanese Appl.* 6/190,283

The catalyst comprises a mordenite zeolite carrier, an auxiliary Ce catalyst and an active component of 0.5–1.5 wt.% Pd supported by ion exchange. Pd can be supported by dipping a carrier supporting Ce into an aqueous solution of Pd nitrate, drying and calcining. The catalyst is used to burn hydrocarbon, particularly small amounts of methane of < 5000 ppm, which also contains steam and O_2, from, for example, combustion fuel exhaust. The catalyst has a high activity and heat efficiency at low temperature.

Trifunctional Catalyst

TOSOH CORP. *Japanese Appl.* 6/198,190

A catalyst able to remove NOx from exhaust gas containing excess O_2, NOx, CO and HC is made of ZSM-type zeolite of molar ratio SiO_2:Al_2O_3 > 15 which carries Zn and Pt, where the zeolite is impregnated by ion exchange. The catalyst changes NOx to N_2.

Heat Utilisation System for Car Engine

TECHNOVA K.K. *Japanese Appl.* 6/207,993

A cathode working both as a heavy H_2O-containing electrolyte decomposer and an excess heat generator comprises micropores of ≤ 0.1 mm diameter formed in a cathodic base of Pd or Pd alloy with porosity of 5–25%. Excess heat vapour effectively generated from the electrolyte decomposer cathode is directed to the engine cylinder chamber by a radiating fin, thus driving the piston rotatively, to power steer the engine.

Photocatalytic Purification of Gases and Brines

R. AALBERS *German Appl.* 4,240,558

Photocatalytic purification of contaminated gases, vapours and brines involves photocatalysis on a catalyst in a closed chamber. The catalyst has high surface area, stability and chemical inertness. It contains at least one semiconductor oxide or a Group IIA or IIB oxide, and a Pt group metal, such as Pd or Pt, at least one actinide, lanthanide or Group IIIB element, supported on TiO_2. Also required is a light source of wavelength 250–400 nm. The catalyst can be regenerated by washing or by the short-wave light source.

Silencer for Large Engine

F. HOERSTING *German Appl.* 4,303,548

A silencer has an array of metal-walled diverging ducts coated with Pt which catalyses automobile exhaust gases. The ducts expand the gas which generates additional thrust, while simultaneously dampening the sound waves. The ducts can have different cross-sectional shapes. The silencer is used in large or aero engines.

Catalyst for Hydrogen Preparation from Carbon Monoxide and Steam

SUED-CHEMIE A.G. *German Appl.* 4,303,715

Cr-free catalyst for reacting CO with steam to form H_2 and CO_2 contains Fe oxide, CuO, rare earth oxide and/or ZrO_2, 0.1–30% base metal oxides of ionic radius 50–72 pm (except Cr), 0–0.1% Pt group metals and 0–3% BaO. The process produces H_2 or H_2-rich synthesis gas. The catalyst has higher catalytic activity and thermal stability than a Cr-containing catalyst, which could cause health and environmental hazards.

Catalyst for Oxidative Purification of Carbon Dioxide

LEUNA-WERKE G.m.b.H. *German Appl.* 4,305,386

The catalyst which removes organic impurities, especially saturated HC, from CO_2 used in the food industry, contains Pd and/or Pt on a support of α-Al_2O_3 with specific surface area of ≤ 50 m^2/g. The catalyst preferably contains 0.05–0.1% Pt, 0.03–0.05% Pd and 0.03–0.05% Cu, Fe or Ni. The heavy metal compounds are enriched on the outside by precipitation from a metal solution at pH 6–8. The catalyst is highly active, heat stable and converts 90–99 % of saturated HC and also converts S to SO_2.

Production of Mono-Oxidised Products

VER ZUCKERINDUSTRIE *German Appl.* 4,307,388

Mono-oxidised products from carbohydrates, carbohydrate derivatives and primary alcohols are prepared by feeding the raw material to a continuous oxidation process which has supported Pt group metal catalysts, such as Pt/C, and continuously separating the monocarboxylic acid products at an electrodialysis stage. Selectivity to mono-oxidised products is improved and the space/time yield is high.

Active Carbon-Supported Platinum Group Metal Hydrogenation Catalyst

DEGUSSA A.G. *German Appl.* 4,308,101

A process is claimed for the production of hydrogenation catalysts containing at least one Pt group metal and optional promoters and/or modifiers on a HNO_3-washed active C support, which is pretreated with H_2O_2 or Na hypochlorite before adding the catalyst metal. The catalysts are stable and have increased activity.

Zeolite Containing Palladium Catalyst

NIPPON SHOKUBAI CO. LTD. *German Appl.* 4,340,650

An absorbent for hydrocarbons in waste gas contains 0.001–10 wt.% Pd/zeolite catalyst, preferably H-type zeolite. It can absorb C_2H_4 and hydrocarbons from exhaust gases from engines, especially petrol and diesel engines, steam boilers and industrial plant.

Three-Way Catalyst for Engine Exhaust Gas Purification

MAZDA MOTOR CORP. *German Appl.* 4,402,436

An exhaust gas purification catalyst, effective at low temperature, has a support with a first and a second catalyst coat containing Pd/Al_2O_3 and Pd/CeO_2, respectively. The catalyst has better properties than usual for removal of HC in the low temperature region.

FUEL CELLS

Fuel Cell Manufacture

TOKYO GAS CO. LTD. *Japanese Appls.* 6/203,848–49

The production involves mixing catalyst containing Pt and C with solvent to dilute the ion exchange resin. A slurry is then made. The ion exchange resin film acts as a solid giant molecular electrolyte film on the Pt/C electrode base film, giving a H_2O repellent electrode sheet. Two of the sheets are joined into one unit by hot pressing. Simplified production allows the generation of large electric current at low temperatures.

Preparation of Alloy Catalyst for Fuel Cell

TANAKA KIKINZOKU KOGYO K.K. *Japanese Appl.* 6/246,160

The method comprises adding a second and a third metal salt to a Pt catalyst; reducing, heating to obtain a Pt alloy catalyst, and acid treating the catalyst. Preferably, the second metal comprises Ni in atomic ratio 50% per Pt and the third metal comprises Co in atomic ratio 50% per Pt. The catalyst is used in fuel cells and retains a stable electric potential.

ELECTRICAL AND ELECTRONIC ENGINEERING

Electric Discharge Electrode

TANAKA DENSHI KOGYO K.K. *Japanese Appl.* 6/112,263

An electrode for automatic wire bonding is made of 99.9% pure Pt alloy and contains other alloying elements such as: 1–35 wt.% Ir, 1–30 wt.% Pd, 1–20 wt.% Au, 1–25 wt.% Ni, 1–15 wt.% Ru and 65 wt.% Pt. An electric discharge passing through the electrode fuses the electrode tip to a ball shape which stably bonds the tip electrode of a semiconductor device.

Anti-Oxidation Palladium Powder

SHOEI KAGAKU KOGYO K.K. *Japanese Appl.* 6/172,802

Anti-oxidation Pd powder contains ≥ 0.005 wt.% alkali earth metal, such as Mg, Ca, Sr or Ba. The Pd powder is used as the conductive material in thick conductive paste. The paste is used to pattern electrodes in sheets for layering in laminated ceramic capacitors.

High Density Recording Using Photomagnetic Medium

HITACHI LTD. *Japanese Appl.* 6/176,415

A recording film comprises reciprocal laminations of Pt and/or Pd and Co. An undercoat film 10–100 Å in thickness is selected from Pt, Pd, Au, Ag or Cu. The medium is suitable for high density recording, and has improved photomagnetic characteristics.

Conductive Paste Compositions

MURATA MFG. CO. LTD. *Japanese Appl.* 6/209,152

The conductive paste composition comprises 50–70 wt.% of Pd, Ag-Pd, Ni and Cu, 1.0–1.8 wt.% of resin such as (m)ethyl cellulose, etc., and a solvent. The paste is used for example in the preparation of the inner electrode of multilayered capacitors by screen printing.

Conductive Paste for Thick-Film Resistors

SUMITOMO METAL MINING CO. *Japanese Appls.* 6/223,616–18

Conductive paste comprises 15–35 wt.% PbO, 20–40 wt.% SiO_2, 5–25 wt.% CaO, 5–20 wt.% Al_2O_3, 3–6 wt.% glass powder, 2–8 wt.% Bi oxide powder and Pt group metal powder. Bi oxide powders mixed with B oxide in Ag-Pd paste containing glass powders as binder can also form the conductive paste. Good solderability for resistors can be obtained.

Conductive Paste

ASAHI GLASS CO. LTD. *Japanese Appl.* 6/223,622

Conductive paste for the section between a package frame and the carrier for a circuit device comprises 60–95 wt.% Ag, 1–20 wt.% Pd, 1–5 wt.% glass frit and 3–20 wt.% Bi oxide. It allows reliable conductors to be buried in glass.

High Permeability Alloy for Magnetic Recording Heads

DAIDO TOKUSHUKO K.K. *Japanese Appl.* 6/228,718

The high permeability alloy comprises, by wt.%, 6.0–12.0% Si, 4.0–8.0% Al, one or more of Ti, V, Zr, Nb, Mo, Hf, Ta and W, and one or more of Ru, Rh, Pd, Os, Ir, Pt, Au and Ag, and balance Fe. The alloy is used for heads for magnetic recording/regeneration. Excellent magnetic characteristics and high wear resistance are obtained.

Thin Films for Hard Magnetic Disks

NEC CORP. *Japanese Appl.* 6/259,767

High density thin film medium is manufactured by forming Cr base film on a substrate, and then forming a magnetic film of Co-Cr-Ta alloy containing Pt on the base film, followed by heating. High coercive field strength is maintained, rectangularity ratio is improved and remanent magnetisation is heightened.

MEDICAL USES

Metallic Material for Dental Prostheses

I. SHOHER *U.S. Patent* 5,336,091

A mouldable dental crown is prepared from a uniform mixture of high melting point particles of average diameter 4–80 μm consisting of an alloy containing ≥ 12% each of Pd and Pt, and ≥ 20% Au; low melting point Au or Au alloy, and a volatile wax binder, the binder forming 30–80% by volume of the mixture. The material has uniform and repeatable porosity with minimised shrinkage. Properties are easily controlled by adjusting the metal ratio and porosity.

Dental Restoration Alloys

P. SUNDER-PLASSMANN *German Appl.* 4,306,542

A Au-Ti alloy, used in dental restoration work, contains either 50–91 wt.% Au and 50–9 wt.% Ti, or Au and Ti and ≤ 20 wt.% Pt and/or Pd, and/or ≤ 15 wt.% of another alloy component suitable for dental use. It aids dental restoration with crowns and bridges.

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