

CHEMICAL TECHNOLOGY

Electrolytic Preparation of Highly Dispersed Pd-Ag Powders of Predefined Chemical Composition

B. P. YUR'EV and S. P. SHKURYAKOVA, *Porosh. Metall.*, 1973, 13, (6), 6-10

X-ray studies were made on highly dispersed Ag-Pt powders obtained electrolytically from NH_3 solution with Pt and Ag nitrates and on the effect of different electrolysis parameters on their current yields, chemical compositions and dispersion.

DENTAL AND MEDICAL USES

Towards a Dosimetric System for Use with Iridium-192 Wires in Interstitial Therapy: a Suggested Protocol for Planning the Single Plane Implant

A. WAMBERSIE and A. DUTREIX, *Atomkern. Energie*, 1973, 22, (2), 134-138

The results of a dosimetric study for planning single plane implants of parallel equidistant Ir-192 wires are described. Dose distributions were computed for different arrangements of wires.

NEW PATENTS

METALS AND ALLOYS

Internal Oxidation of Work-hardened Platinum and Gold and Alloys thereof

JOHNSON, MATTHEY & CO. LTD.

British Patent 1,340,076

Pt-group metals and alloys thereof are dispersion-strengthened by alloying with up to 5 wt.% of a material capable of forming a stable, refractory oxide, flame-spraying the alloy into water to form granules, ball-milling and recrystallising the granules and then internally oxidising prior to compacting and sintering.

Ball Point Pen Writing Ball

THE PARKER PEN CO. *U.S. Patent 3,746,456*

Cemented carbide compositions to make ball points are produced from WC or TiC and a binder alloy containing Co and Ni, and ~18-20% Cr, 0.1-1% Pt and 0-3% Fe.

Cobalt-Platinum Group Alloys Whose Anisotropy Is Greater than Their Demagnetisable Field

INTERNATIONAL BUSINESS MACHINES CORP.

U.S. Patent 3,755,796

These alloys contain not less than 50% Co and the balance in the form of Ru, Re, Os, Rh, Ir, Si, Ge, As and/or Pt able to depress the saturation magnetisation field of the Co.

CHEMICAL COMPOUNDS

Synthesis of Silylmetallic Complexes

DOW CORNING CORP. *U.S. Patent 3,746,732*

Silyl complexes of Pt and Pd are prepared by reacting below 150°C, disilanes or hydrosilanes with phosphine complexes of the formula $\text{M}(\text{PR}'_3)_2\text{Y}_2$. Specifically, hexachlorodisilane is reacted with $\text{Pd}(\text{PPhMe}_2)_2\text{Cl}_2$ to give $\text{Pd}(\text{PPhMe}_2)_2(\text{SiCl}_3)\text{Cl}$ and/or $\text{Pd}(\text{PPhMe}_2)_2(\text{SiCl}_3)_2$.

ELECTROCHEMISTRY

Electrolysis Electrodes

ELECTRONOR CORP. *British Patent 1,344,241*

A new electrode coating consists of a coherent mixture of cobalt titanate and a valve metal oxide-precious metal oxide solid solution, e.g. a TiO_2 - RuO_2 solid solution.

Brine Electrolysis Electrode

CHEMNOR A.G. *U.S. Patent 3,751,296*

An electrically conducting base is coated with a mixed crystal material formed from a film-forming metal oxide and a Pt-group metal oxide to form a brine electrolysis electrode. Ru and Ti oxides are suitable materials.

Brine Electrolysis Anode

PROGIL *U.S. Patent 3,763,005*

The cell has a cationic permselective membrane placed between a porous anode of the Ti-group having a Pt-group metal coating on the surface opposite the membrane and the cathode.

ELECTRODEPOSITION AND SURFACE COATINGS

Metallisation of Plastics

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 1,335,962

Substrates to be chemically plated may be treated with an organic cation solution and then with a Pt-group metal solution to complete the sensitisation.

Electroless Deposition of Palladium Alloys

U.S. SECRETARY OF THE ARMY

U.S. Patent 3,754,939

The constituents for a plating solution for providing a low porosity electroless deposit of Pd alloys

with a minor amount of Ni, Co or Zn are described.

Electrolytic Deposition of Metals

PRODUITS CHIMIQUES PECHINEY-SAINT-GOBAIN
French Appl. 2,161,825

A bath for the electrolytic deposition of Pt and/or Ir is prepared from compounds which give Pt and Ir bromide ions in aqueous solution, and acids chosen from HNO₃, H₂SO₄, HClO₄ and HBrO₃.

LABORATORY APPARATUS AND TECHNIQUE

High Emittance Coating for Noble Metals

THE UNITED STATES ATOMIC ENERGY COMMISSION
U.S. Patent 3,751,295

A controlled emittance is applied to a noble metal selected from the group including Ru, Rh, Pd, Os, Ir, and Pt by plasma arc spraying modified Al₂O₃ on a surface of the noble metal, the Al₂O₃ being modified by having a HCl-washed Al₂O₃ powder containing a dispersion of a metal black.

JOINING

Tailless Wedge Bonding of Gold Wire to Palladium-Silver Cermet

GENERAL ELECTRIC CORP. *U.S. Patent* 3,747,198

Wire bonds are made directly to Pd-Ag cermet surfaces on ceramic substrates when hard, as-drawn Au wire is wedge bonded to the Pd-Ag surface with a heated ultrasonic bonding wedge.

HETEROGENEOUS CATALYSIS

Aldehyde Production Catalysts

JOHNSON, MATTHEY & CO. LTD.

British Patent 1,335,531

An organic compound is hydroformylated or carbonylated in the vapour phase using, as catalyst, a hydrido carbonyl *bis* or *tris* (trisubstituted PH₃, AsH₃ or SbH₃) Rh complex deposited on a solid support.

Norbornyl Compounds

MONSANTO CO. *British Patent* 1,336,101

Norbornyl butanones are produced from the corresponding butenones by hydrogenation over a Pd/C catalyst.

Catalytic Reforming of Gasoline Fractions

UNIVERSAL OIL PRODUCTS CO.

British Patent 1,337,788

Low octane fractions are reformed to higher octane fractions using a supported mixture of a Pt-group metal and Re as catalyst with S added to the feedstock. A suitable catalyst has 0.2% Re and 0.55% Pt on γ - or η -Al₂O₃.

Hydrocarbon Conversion Process

STANDARD OIL CO. *British Patent* 1,339,554

Very high yields of aromatics and gasolines have been produced from a petroleum feedstock using a Group VIII metal, especially Pt, on a co-catalytic solid support consisting of a refractory oxide and mordenite.

Tertiary Amine Production

DAI-ICHI KOGYO SEIYAKU CO. LTD.

British Patent 1,341,871

Higher alkyl groups are introduced into tertiary amines using hydroxy compounds in the presence of Pt-group metal catalysts. For example diethyl octyl amine and dodecyl alcohol are reacted in the presence of Ru powder to give an 83% yield of ethyl dodecyl octyl amine.

Hydroxytetralone and Its Derivatives

WARNER-LAMBERT CO. *British Patent* 1,342,866

Hydroxytetralone is produced by the reduction of dihydroxynaphthalene with H₂ in the presence of a Pd catalyst such as 10% Pd/C.

Process for the Isomerisation of Olefins

PETRO-TEX CHEMICALS CORP.

U.S. Patent 3,752,864

Aliphatic hydrocarbon olefins having 4 to 5 C atoms are isomerised to their equilibrium mixture over a unique catalyst of PdO-WO₃ on a support.

Vapour Phase Reaction of Aromatic Nitro Compounds to Form Aromatic Isocyanates

OLIN CORP.

U.S. Patent 3,754,014

Nitro compounds are reacted with CO to give isocyanates in the presence of Rh, Pd, Ru, Ir, Os or Pt oxides or halides, preferably mixed with a Cu compound on a SiC support.

Continuous Process for The Purification of Monochloroacetic Acid

FARBWERKE HOECHST A.G. *U.S. Patent* 3,754,029

Di- and trichloroacetic acid contained as impurities in crude monochloroacetic acid are partially dehalogenated and transformed to monochloroacetic acid in a continuous process in which the crude is trickled through a catalyst layer, the active constituent of which is a Pt group metal, e.g. Pd/SiO₂. The process operates at 110-145°C in the presence of H₂.

Simultaneous Production of Aromatic Hydrocarbons and Isobutane

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,755,140

A naphtha feed-stock is subjected to catalytic reforming, separation and hydrocracking to produce aromatics and isobutane. The reforming stage uses low severity conditions and employs Pt-group metal catalysts, e.g. Pt plus F on Al₂O₃.

Bimetallic Catalytic Composite

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,761,426

A catalytic composite made of a Pt component, a Pb component and a halogen component with a porous carrier material is disclosed. About 0.01–2% Pt and about 0.1–3.5% halogen are present and the Pb component is present in an atomic ratio to Pt component of ~0.05:1–0.9:1.

Dehydrogenation Method

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,763,255

Hydrocarbons are dehydrogenated by contacting them with a catalytic composite of a Pt component, an Ir component and an alkali or alkaline earth metal component and a porous carrier material in a manner such that the Pt and Ir are uniformly dispersed in the carrier material and are present in an atomic ratio of Ir:Pt of ~0.5:1–1.5:1. S must be absent.

Exhaust Gas Treatment Catalyst

AZOTE ET PRODUITS CHIMIQUES S.A.

French Patent 2,153,652

I.C.E. exhaust gases are treated over a catalyst consisting of an Al_2O_3 and/or aluminosilicate support carrying 0.01–0.05% Pt-group metal and 5–20% Ni as oxide. Suitably 8–12% Ni and about 0.02% Pt are on a honeycomb support.

Treating Exhaust Gases

FORD FRANCE S.A.

French Appl. 2,157,351

Car exhaust gases are contacted with a first catalyst to reduce NO_x and then with a Ru-based catalyst to reduce the NH_3 compounds formed after contact with the first catalyst. The first catalyst is of Pt, Pd, Ir or Rh.

Metallic Catalysts

JOHNSON, MATTHEY & CO. LTD.

French Appl. 2,160,582

Oxidation and reduction catalysts and catalysts for the preparation of CH_4 by the steam reforming of naphtha consist of an inert support impregnated or covered with a mixture or alloy of 5–55% Ru, 1–20% Rh, optionally 0–20% of a base metal, with the remainder Pt.

Exhaust Gas Purification Catalyst

DEUTSCHE GOLD- & SILBER-SCHEIDANSTALT

German Offen. 2,214,797

Exhaust gases are treated over a Pt-group metal deposited on a mixture of Al_2O_3 and Cr plus V, Mn, Fe, Co, Ni or Cu oxide.

Exhaust Gas Treatment Catalyst

AKZO N.V.

Dutch Appl. 72.04127

A mixture of SiO_2 with <50% of Al_2O_3 is shaped and hydrothermally treated at above 600°C until shrinkage ceases. Then it is impregnated with 0.05–0.5% of Pt-group metal, e.g. Pt and/or Pd.

HOMOGENEOUS CATALYSIS

Rhodium Catalysts

JOHNSON, MATTHEY & CO. LTD.

British Patent 1,335,529

Organic compounds are hydrogenated, hydroformylated or carbonylated using, as catalyst, either a hydrido carbonyl *bis* or *tris* (trisubstituted PH_3 , AsH_3 or SbH_3) Rh complex, or a halogen or pseudo-halogen Pt-group metal complex containing either an organic isocyanide, an organic compound containing a Group 5B or 6B atom with a lone pair or a Sn(II) or Ge(II) halide. Preferably, the reaction solution is gravity-fed through a particulate bed through which the reactant gas stream passes in con- or counter-current relationship. In the one example $RhH(CO)(PPh_3)_3$ is used to produce n-hexaldehyde from pentene-1, CO and H_2 .

Rhodium Complexes for Catalytic Reactions

JOHNSON, MATTHEY & CO. LTD.

British Patent 1,338,225

Hydroformylation and hydrogenation of gaseous olefins such as C_3H_6 may be carried out in the absence of inert solvent by using a molten Ph_3P medium containing a hydrido carbonyl complex of rhodium. Catalytic species thought to be present are $RhH(CO)(PPh_3)_3$, $RhH(CO)_2(PPh_3)_2$ and $RhH(CO)(PPh_3)_2$.

Preparation of Aldehydes from Olefins

ETHYL CORP.

U.S. Patent 3,752,859

Aldehydes are prepared by reacting CO with an olefin and a primary alcohol in the presence of a Rh halide catalyst. For example, when 1-hexene is reacted with MeOH and CO in the presence of catalytic quantity of Rh(III) chloride trihydrate, a mixture of n-heptaldehyde and 1-methylhexanal results.

Exchange Reactions of Octadienyl Esters with Active Hydrogen Compounds

UNION CARBIDE CORP.

U.S. Patent 3,755,451

3-octa-1,7-dienyl acetate is readily isomerised to 1-octa-2,7-dienyl acetate in the presence of Pd catalysts and a tertiary amine. This same allylic isomerisation occurs with butenyl acetates. Pd acetylacetonate is a suitable catalyst.

Isomerisation of Hexadiene Acids

FARBWERKE HOECHST A.G.

German Offen. 2,207,019

Hexadiene acid isomerisation to sorbic acid is catalysed by complexes of Pt-group metals in various valency states, especially Pd(O) and Pd(II) phosphine complexes.

Oxalic Acid or Ester Production

ROHM G.m.b.H.

German Offen. 2,213,435

A Pt-group metal salt or complex and a salt of a

more electropositive metal able to exist in several oxidation states are used to catalyse the reaction of CO and O₂ in aqueous or alcoholic medium to give (COOH)₂ or its ester with the alcohol present. PdCl₂, LiCl and Cu acetate are used in one example.

Acetoxyacetone Production

FARBWERKE HOECHST A.G.
German Offen. 2,220,666

Acetoxyacetone is produced when allyl acetate is reacted with H₂O and O₂ in the presence of PdCl₂ and a cupric salt.

FUEL CELLS

Thallium Oxide Fuel Cell

UNITED AIRCRAFT CORP. *British Patent 1,334,288*

The fuel cell electrolyte uses Tl₂O as in the eutectic Tl₂O/TlNO₃/AgNO₃, with a Pt-doped Ni fuel electrode and a Pt-Au-doped Ni oxidant electrode.

Metal Phosphides and Chalcogenides

SIEMENS A.G. *German Offen. 2,216,191*

Pt-group metal phosphides and chalcogenides may be produced by the direct reaction of the components in the presence of NaF or Na₂SiO₃. The products may be used in fuel cells as electrode catalysts.

CHEMICAL TECHNOLOGY

Catalytic Reactor

INSTITUT NEFTEKHIMICHESKOGO SINTEZA IM. A. V. TOPCHIEVA *British Patent 1,340,156*

A reactor for producing high purity H₂ from hydrocarbons and for other conjugate chemical reactions has a partition wall dividing it into two sections. The wall may be formed of a Pd alloy plate, coiled in a double helix.

Protective Coatings by Electrolysis

INTERNATIONAL NICKEL CO. INC.
U.S. Patent 3,763,002

Protective oxide coatings having the required electrical conductivity, adherence to substrate and heat- and corrosion-resistance are formed by oxidation of Ru in situ on the surface of the article to be protected.

GLASS TECHNOLOGY

Alloys for Glass Handling

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT
British Patent 1,339,477

Tools and furnace equipment for handling glasses and molten oxides at 900–1300°C are made or surfaced with alloys of 10–30% Rh or Ir and/or 30–50% Pt, the remainder being Pd.

ELECTRICAL AND ELECTRONIC ENGINEERING

Electric Fuse Link

R.C.A. CORP. *British Patent 1,336,938*

A supported fuse has a pair of contacts with a space between bridged by a Ti fuse film preferably as a Ti-Pt sandwich structure.

Electric Flow Heaters

MARSTON EXCELSIOR LTD.

British Patent 1,339,062

Electric flow heaters for heating liquids preferably have Ti electrodes coated with Ir, Rh, an Ir-Pt alloy, a Rh-Pt alloy or an Ir-Rh-Pt alloy.

Multilayer Capacitors

ILLINOIS TOOL WORKS INC.

British Patent 1,340,414

Stacked multilayer ceramic capacitors are produced using screen-printed ceramic layers with electrode layers of Pd paste. Ag-glass frit may be used to provide a fired external connection.

Power Rectifier Connections

R.C.A. CORP. *British Patent 1,342,645*

Ta electrodes are affixed to GaAs semiconductor bodies by coating both electrodes and bodies with Pd and Ag and sintering the coatings before joining the parts.

Alloy Metallising Compositions

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 3,756,834

Alloys of three or more metals are used in ceramic capacitor electrodes which have a critical surface area. The specific metals of the alloy are Pd, Pt and Au. The metallising compositions are especially suitable for capacitors on ceramic dielectric substrates which contain Bi₂(SnO₃)₃.

TEMPERATURE MEASUREMENT

Hot Region Determination

COMMISSARIAT A L'ENERGIE ATOMIQUE

British Patent 1,334,833

A three-wire measuring element sheathed in Ir is used for locating hot regions and determining their temperature. It is embedded in an insulator which conducts at high temperatures.

Thermally Actuated Devices

PHILIPS ELECTRONIC & ASSOCIATED INDUSTRIES LTD.

British Patent 1,336,366

Sensor elements in thermally actuated devices are made from a plastically deformed inter-metallic compound. The compounds listed include Au, Pd and Pt complexes of Ni/Ti, Ti/Co, such as Ni_{1-x}TiPt_x where 0 < x ≤ 0.5.