

Increase of Passivity and Corrosion Resistance of Titanium by Alloying Its Surface with Palladium

N. D. TOMASHOV, G. P. CHERNOVA and T. A. FEDOSEEVA, *Zashchita Metal.*, 1977, **13**, (2), 164-169

Studies of the electrochemical behaviour and corrosion resistance of Ti modified by Pd electrodeposits (1, 5 and 10 μm thick) show its high passivity and corrosion resistance in 20-50% H_2SO_4 and 5-20% HCl at 100°C. The unmodified Ti in these conditions becomes fully corroded. It is shown that a Ti surface with electrodeposited Pd has a higher corrosion resistance in both acids than Ti+0.2%Pd alloy.

GLASS TECHNOLOGY

Effect of Some Manufacturing Conditions on the Optical Loss of Compound Glass Fibers

S. SHIBATA and S. TAKAHASHI, *J. Non-Cryst. Solids*, 1977, **23**, (1), 111-122

The production of low-loss optical glass fibres in Pt crucibles was studied and the effects of the Pt contamination and gas flow on the optical loss of compound silicate glass fibres were investigated. It is shown that when the concentration of Pt dissolved into the glass from the Pt crucible is >50 ppm, the optical loss is ~ 5000 dB/km.

NEW PATENTS

METALS AND ALLOYS

Electroconductive, Corrosion Resistant Silicon Alloys

P.P.G. INDUSTRIES INC. *British Patent 1,466,455*
A Si alloy has an electroconductivity greater than $100/\Omega\text{cm}$ and consists of 0.2-2% of a dopant selected from N, P, B and Al, 1- $<50\%$ of a transition metal such as Ru, Rh, Os, Ir, Pt, Pd, Ag or Au, balance Si. The alloy has a structure in the form of a predominant, discontinuous, Si rich phase, continuous rivulets of a transition metal silicide rich phase surrounding the Si rich phase, and discrete nodules of a phase rich in the dopant material.

Re-orientation of Grain Stabilised Platinum

JOHNSON MATTHEY & CO. LTD.

U.S. Patent 4,002,503
The mechanical properties of a previously hardened Pt-Rh alloy which includes dispersed phase Zr oxide as a strengthening element are improved by cold working the composition at a temperature below that at which recrystallisation occurs and

ELECTRICAL AND ELECTRONIC ENGINEERING

Study of Al/Pd₂Si Contacts on Si

H. GRINOLDS and G. Y. ROBINSON, *J. Vacuum Sci. Technol.*, 1977, **14**, (1), 75-78

Studies of the interaction of an Al interconnect layer with Pd₂Si contacts on an *n*-type Si substrate show that the contact barrier energy Φ_{BN} decreased initially from ~ 0.71 to 0.65 eV. This decrease was shown to be due to the decomposition of the Pd₂Si layer. It is suggested that Al may enter the *n*-type Si as a compensating impurity during prolonged heat treatments.

MEDICAL USES

The Crystal and Molecular Structure of *cis*-Dichlorobis(cyclohexylamine)platinum (II)

J. IBALL and S. N. SCRIMGBOUR, *Acta Cryst. B*, 1977, **33**, (4), 1194-1196

Crystallographic studies of the anti-tumour agent, *cis*-dichlorobis(cyclohexylamine)Pt(II) show it to be orthorhombic with $a=26.12$, $b=6.660$, $c=8.981\text{\AA}$, $Z=4$, space group *Pbcn*. The Pt atom is surrounded by two N and two Cl atoms in a *cis* square-planar arrangement. The shortest Pt-Pt distance is 4.49Å.

then annealing. The recrystallisation which occurs during annealing results in an elongated grain structure highly oriented in the direction of working.

High Temperature-stable Metal Powder

JOHNSON MATTHEY & CO. LTD.

German Offen. 2,630,062

A metal powder which does not agglomerate or sinter at or around the melting point of the metal consists of a refractory substrate such as Al_2O_3 , SiO_2 or Si carbide coated with a Pt group metal, Au or Ag.

CHEMICAL COMPOUNDS

Osmium Tetroxide Complexes

JOHNSON MATTHEY & CO. LTD.

German Offen. 2,630,823

Complexes may be formed from OsO_4 and compounds with a heterocyclic ring having one or two N atoms, such as phthalazine, and used for the fixing and/or dyeing of cells. The treated cells may then be examined by electron microscopy.

ELECTROCHEMISTRY

Bipolar Cell

SOLVAY ET CIE. S.A. *British Patent 1,469,832*
A bipolar diaphragm-type multicompartment cell consisting of a stack of bipolar elements has the anode structure of the elements of the cell formed of Ti with a coating including one or more Pt group metals or oxides.

Platinum-Iridium Catalytic Anode

GENERAL ELECTRIC CO. *U.S. Patent 3,992,271*
A catalytic anode, for use in a gas generation apparatus, used for concentrating O₂ or generating O₂ and H₂ by electrolysis, employs a Pt-Ir alloy, with an Ir content of 5-50%, as a catalyst.

Noble Metal Electrodes for a Combustible Sensor

WESTINGHOUSE ELECTRIC CORP. *U.S. Patent 4,005,001*
An apparatus for determining the presence of predetermined combustible constituents such as methane, H₂ and CO, in an excess O₂ gas mixture is a solid electrolyte electrochemical cell which has one electrode made from Pt, Pd or Rh and the other from Ag or Au.

LABORATORY APPARATUS AND TECHNIQUE

Particle Detection

W. L. FITE ET AL *British Patent 1,465,751*
A particle of dust or a macromolecule of 1000 AMU or greater is induced to strike a heated surface of Pt, Ir, Re or Rh, to cause the release of electrons or ions as a detached burst, and a detector is located so as to sense the electrical charge of the burst. This induces in the detector an electrical pulse, the magnitude of which is related to the particle size.

Ceramic Gas Sensor

FORD MOTOR CO. LTD. *British Patent 1,467,735*
The partial pressure of O₂ in an ICE exhaust gas, is sensed by a device which has a porous, sintered ceramic body of particles of a 99.5% pure transition metal oxide, a pair of Pt electrodes and electrical means connected to the electrodes for responding to the inter-electrode resistance. They include a Pt-Rh alloy resistance wire and a Au-Pd-Pt and Au-Pd combination thermocouple.

Ignition Device

JOHNSON MATTHEY & CO. LTD. *German Offen. 2,630,749*
An ignition device generates sparks between two electrodes projecting from or mounted on insulating or semiconducting surfaces. The active surfaces consist predominantly of Co or Ni alloyed

or composited with one or more metals from the group consisting of Ru, Rh, Pd, Ir, Pt, Au or Ag.

JOINING

Brazing Alloys Containing Noble Metals

V. P. KOSTERUK ET AL *U.S. Patent 3,998,632*
A brazing spelter composition for joining high melting carbides, ceramics, etc., to each other or to high melting alloys consists of 2-30% Cu, Au and/or Ag, 2-21% Al, B, Sc, Y, lanthanides, C, Si, Ge, Ti, Zr, V, Nb, Ta, P, Cr, Mo, W, Mn, Tc, Re, Os, Co, Ni, Rh, Ir and/or Pt, and the balance Hf.

HETEROGENEOUS CATALYSIS

Amorphous Platinum Metal Particles

BRITISH PETROLEUM CO. LTD. *British Patent 1,470,034*
A new form of Pt consists of amorphous Pt metal particles which do not produce the X-ray diffraction pattern characteristic of crystalline Pt. The particles are produced by depositing Pt on a support, oxidising it at a temperature of at least 300°C and then reducing it at a similar temperature in H₂.

Hydrazine Decomposition Catalyst

KALI-CHEMIE A.G. *British Patent 1,470,260*
A catalyst for the spontaneous decomposition of hydrazine and its derivatives, especially for space propulsion systems, is obtained by impregnating active Al₂O₃ with an Ir compound and optionally an Os compound at least four times. After each impregnation the damp product is dried at 100-300°C in an inert atmosphere before finally the compound is reduced to metal at a temperature of 180-300°C in H₂.

Helium Cooled Nuclear Reactors

U.K. ATOMIC ENERGY AUTHORITY *British Patent 1,470,795*
The reactor has further (recycling) circuitry in addition to a closed loop main coolant circuit, which includes a Pt catalyst for oxidising the H₂ content of the coolant gas.

Storage Battery Catalysts

ROBERT BOSCH G.M.B.H. *British Patent 1,471,307*
A recombination catalyst for gases generated in a secondary cell consists of bodies of Pd or C, or the like, sheathed in PTFE so that they are able to float in the battery electrolyte.

Platinum Metal Conversion Catalysts

EXXON RESEARCH & ENGINEERING CO. *U.S. Patent 3,993,598*
The preparation of two novel catalysts for the catalytic hydro-conversion of hydrocarbon mat-

erial contained in heavy crudes and residuals is described. The method consists of dispersing a compound of a Group VIB and/or Group VIII, such as Pt, Pd, Ir, Os, Ru, Rh, etc., and an Al halide salt in an aqueous or alcoholic medium, maintaining the temperature at 30–100°F, adding olefin oxide and maintaining the pH at 5–8, raising the temperature so as to form a cogel, ageing the cogel, separating, washing, drying and calcining the cogel and impregnating the resulting catalyst with a Group IVA metal oxide.

Catalyst Support Assembly

MATTHEY BISHOP INC. *U.S. Patent 3,993,600*

A catalyst support structure, for use with woven gauzes of Pt metal or Pt/Rh alloy, in catalytic converters, consists of a number of woven screens stacked together, the screens being composed of an alloy of 4–6% Al, 20–30% Ni, 0.25–1.0% Cr and the balance Fe.

Platinum Group Exhaust Gas Purification

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 4,001,143

The catalyst is prepared by impregnating Al_2O_3 with a solution which contains at least one Pt group metal which will be present in a concentration of 0.001–5.0% on the support, at least one lanthanide in an atomic amount of 1–1000 times that of the Pt group metal and at least one Group IA or IIA metal compound in an atomic amount of 0.25–4 times that of the Pt group metal, drying and heating at least 800°C for 1 h.

Platinum Group Catalyst for a Battery

JAPAN STORAGE BATTERY CO. LTD.

U.S. Patent 4,002,496

A catalyst produced by impregnating a Pt group metal, such as Pd, into granules obtained by sintering and forming active Al_2O_3 , is used in a battery which contains an aqueous electrolyte.

Noble Metal Catalyst for Cleaning Air Which Contains Carbon Monoxide

KANEBO LTD.

U.S. Patent 4,003,979

Polluted air containing CO is cleaned by passing it through an adsorbent filter and through a noble metal catalyst layer. The catalyst preferably consists of Pd on active C with 20–50% H_2O .

Purification of Exhaust Gases

INSTITUT FRANCAIS DU PETROLE

French Appl. 2,298,688

The exhaust gas, together with air, is passed over a catalyst bed, the air being introduced in variable quantities during the passage of the gas over the catalyst bed. The amount of air introduced depends on the quantity of the exhaust gas produced by the engine. The catalyst consists of the oxide(s) of Pt, Rh, Cu, Ag, Zn, V, Cr, Mo, W and Mn on a refractory support.

HOMOGENEOUS CATALYSIS

Colloidal Platinum Catalyst

PROTOTECH CO.

U.S. Patent 3,992,331

An improved catalyst, for various uses, especially under high temperature conditions, is prepared by applying a compound of formula $H_3Pt(SO_3)_2OH$ to a substrate, thermally decomposing the acid in air and then reducing it to form metallic Pt particles having an average particle size in the range 15–25Å.

Ruthenium, Iridium and Rhodium Hydrogenation Catalyst

FIRESTONE TYRE & RUBBER CO.

U.S. Patent 3,993,855

Selective hydrogenation of unsaturated hydrocarbon polymers is catalysed by the complexes $RhCl(PPh_3)_3$, $RhClCO(PPh_3)_2$, $RhHCO(PPh_3)_3$, $RuHCl(PPh_3)_3$ and $IrH_5(PPh_3)_3$.

Asymmetric Hydrogenation Catalyst

MONSANTO CO.

Dutch Appls. 76,09339-40

Asymmetric hydrogenation, especially of acetamidophenyl propane enantiomorphs, is catalysed by a Rh, Ru or Ir optically active bisphosphine complex, such as a Rh fluoroborate complex of a di(anisylphenylphosphino)ethane.

Hydroformylation Catalyst

JOHNSON MATTHEY & CO. LTD.

Russian Patent 503,503

The hydroformylation of olefins e.g., propylene to alcohols and aldehydes is catalysed by a neutral Rh complex, specifically hydrocarbonyl tris-(triphenylphosphine)Rh, $RhH(CO)(PPh_3)_3$, in the presence of an excess of triphenylphosphine.

FUEL CELLS

Flow-Through Type Fuel Cells

KANEBO LTD.

British Patent 1,467,147

The cell consists of a cathode, an anode and an electrochemical separator. At least one of the electrodes consists of a layer of a woven or knitted fabric formed from organic high polymer fibres of 1–30 μm diameter, each fibre having a 0.1–10 μm thick metal layer on its surface and an electrocatalyst on the metal layer. The metal is Ti, Cr, Rh, Pd, Ru, Pt, Ag, Au etc., and the electrocatalyst is Pt, Pd, Rh, Ir, Ni, Cu and Ag.

CHEMICAL TECHNOLOGY

Recovery of Small Particles of Precious Metals

E. O. ANDERS

U.S. Patent 3,998,629

Small particles of Pt or Au are recovered from a slurry by feeding the slurry on to a layer of Hg

which is flowing down along a conical, downwardly converging inner wall of a housing. The housing is rotated about the vertical axis of the wall at a speed which reduces particles to settle out or amalgamate with the Hg. The particles are subsequently separated out and recovered.

Regeneration of Platinum Group Hydrogenation Catalysts

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 3,998,936

A Pt group hydrogenation catalyst, used in the manufacture of peroxide from an alkylanthraquinone, is regenerated by contacting it, in the presence of the working solution and in the absence of H₂, with either an O₂ containing gas or H₂O₂.

Palladium Additive for Metallisation Activation Bath

LANGBEIN-PFANHAUSER WERKE A.G.

U.S. Patent 4,001,470

An activation bath for use in the chemical coating of synthetic resin bodies with Ni or Cu contains 0.1-20 g gelatin or gum arabic, 1-5 g tartaric or citric acid, 1-5 g H₂SO₄ or HCl, 0.1-5.0 g Pd sulphate, 1-20 g maleic or 1-6 g fumaric acid and H₂O to a volume of 1 l.

Palladium Treatment of Electroconductive Non-Woven Fabrics

HOECHST A.G.

U.S. Patent 4,002,779

The fabrics are manufactured by cleaning a non-woven polar fabric with a polar organic solvent, sensitising the fibre surfaces of the fabric with an aqueous HCl solution of stannous chloride, rinsing with H₂O, activating the surface of the fibres with an aqueous HCl solution of PdCl₂.

Pressed Metal Powder Coins

METALLWERK PLANSEC A.G.

German Offen. 2,633,323

The counterfeiting of coins is made more difficult by pressing coins from a powder mixture which is not homogeneous and/or which contains "tracers" such as Mo, Ta or Th oxide. Pt alloys can be used to produce homogeneous coins containing such a tracer.

GLASS TECHNOLOGY

Glass Fibre Spinneret Mounting

PILKINGTON BROTHERS LTD.

British Patent 1,471,306

Glass is supplied from a forehearth through a duct and an apertured cover plate before reaching a bushing. This arrangement keeps the duct hot and reduces spun fibre breakage. The cover plate and duct are preferably made of the same material as the bushing, a Pt-Rh alloy.

ELECTRICAL AND ELECTRONIC ENGINEERING

Manufacturing Microwave Devices

GENERAL ELECTRIC CO. LTD.

British Patent 1,464,511

A microwave device has a component of ferrite material in which are embedded Pt group metal conductors produced by laying the conductors in grooves in the ferrite body and plasma-spraying ferrite onto the conductors.

Compression Bond Assembly for a Planar Semiconductor Device

WESTINGHOUSE ELECTRIC CORP.

British Patent 1,465,328

Thermal and electrical contact is obtained between a first mounting electrode contact and a first semiconductor region using a planar electrically and thermally conductive preform of Pt and/or Ir or their alloys.

Schottky Barrier Field Effect Transistor

U.S. SECRETARY OF THE AIR FORCE

U.S. Patent 3,999,281

In the manufacture of the transistor Pt is deposited only at the bottom of the groove of a single high resolution mask. This obviates the need for an additional photo-masking step or the necessity of subsequent removal of Pt from other surfaces of the wafer.

Silver Electrical Conductor Compositions

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 4,001,146

Compositions for making electrical conductor patterns on a non-conductive substrate consist of a metal powder and 1-5% glass-free inorganic binder. The binder is made up of Bi oxide and Cu and/or Pb oxides, and optionally MnB₂ and/or MnO₂. The metal powder is either Ag or a mixture of Ag with Pt, Pd, Au or an alloy of Cu with one or more of Pt, Pd, Au and Ag.

TEMPERATURE MEASUREMENT

Paint-On Thermocouple

U.S. SECRETARY OF THE NAVY

U.S. Patent 4,004,948

A paint-on thermocouple is made of thin films of a finely divided mixture of Pt, Ag and Au and the alloy constant is painted on to the surface to be tested.

Resistance for a Resistance Thermometer

W. C. HERAEUS G.m.b.H. *German Offen. 2,527,739*

A resistance for temperature measuring purposes consists of 0.1-10 μm of Pt deposited on an oxidic support, such as Al₂O₃.