

## Iridium Complexes as Hydrosilylation Catalysts

D. C. APPLE, K. A. BRADY, J. M. CHANCE, N. E. HEARD and T. A. NILE, *J. Mol. Catal.*, 1985, **29**, (1), 55-64

Ir complexes are active as catalysts for hydrosilylation reactions, especially those involving 1,3-dienes and 1-alkynes. For ketones, Ir complexes show maximum activity if one molar equivalent of triphenylphosphine is added to the reaction mixture. Ir complexes are also active catalysts for the hydrosilylation of  $\alpha,\beta$ -unsaturated ketones.

## FUEL CELLS

### Fuel Cells: Principles and Prospects

G. PRENTICE, *Chemtech*, 1984, (11), 684-694

A review of the history, theory and current research on fuel cell technology is presented. Electrode materials, fuels, electrolytes, operating conditions and adapting fuel cells for various uses are examined. The efficiencies, cost factors, phosphoric and acid fuel cells, the use of Pt<sub>3</sub>V, molten carbonate fuel cells and future developments are also reviewed.

### Polarization at Pt Electrodes of a Fuel Cell with a High Temperature-Type Proton Conductive Solid Electrolyte

H. UCHIDA, S. TANAKA and H. IWAHARA, *J. Appl. Electrochem.*, 1985, **15**, (1), 93-97

Polarisation phenomena in the Pt electrodes of a proton conducting fuel cell with SrCe<sub>0.95</sub>Yb<sub>0.05</sub>O<sub>3- $\alpha$</sub>  as the solid electrolyte,  $\alpha$  being the number of O deficiencies per perovskite-type oxide unit cell, were investigated by a current interruption method. The polarisation of the cathode could not be neglected below 900°C, whereas the polarisation of the anode was negligibly small. The polarisation resistance at the cathode decreased with increasing O partial pressure. The rate determining step for the cathode reaction was the surface diffusion of adsorbed O atoms on Pt to the active site on the electrolyte.

## NEW PATENTS

### METALS AND ALLOYS

#### Ruthenium Alloy

TOKYO SHIBAURA DENKI K.K. U.S. Patent 4,464,208

An amorphous alloy for a magnetic head contains, in specified proportions, Ru, Co, Fe, Si, B, and at least one of Ti, V, Cr, Mn, Ni, Zr, Nb, Mo, Hf, Ta and W.

#### Permanent Magnet Alloy

RESEARCH INSTITUTE OF ELECTRIC & MAGNETIC ALLOYS U.S. Patent 4,465,526

An easily workable alloy for permanent magnets of high coercive force has a crystalline structure with a fine grain dispersion of alpha phase and gamma phase in a matrix. It contains 19.5-41 at.% Pd, 0.1-27.5 at.% Ag, remainder Fe.

### Application of the Gas Diffusion Electrode of High Performance to Methanol Fuel Cells

N. FURUYA and S. MOTOO, *J. Electroanal. Chem. Interfacial Electrochem.*, 1984, **179**, (1 & 2), 303-306

The application of a gas diffusion electrode of high performance to methanol oxidation in the methanol fuel cell resulted in high current densities of 0.25A/cm<sup>2</sup> at 0.42V, 0.50A/cm<sup>2</sup> at 0.45V and 1A/cm<sup>2</sup> at 0.520mV at 70°C. The counter electrode was a Pt mesh and the electrocatalyst was a Pt + Ru system of varying composition, the loading varying from 0 to 5mg/cm<sup>2</sup>.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### New Thick Film Capacitor Dielectrics

S. J. STEIN, C. HUANG and P. BLESS, *Solid State Technol.*, 1984, **27**, (10), 213-219

A new series of thick film dielectrics for firing at 850-1000°C has been developed from experiments involving Pt/Au, Pd/Au and Au. Dielectric constant nominal values of 25, 50 and 100, respectively, were achieved. The dielectrics had low temperature coefficients of capacitance, Q values >100, high insulation resistance and good stability to thermal, voltage and humidity stresses with Pd/Ag electrodes.

### Performance of Pairs of Hafnium and Rhodium Self-Powered in-Core Detectors in a Pressurized Water Reactor

H. D. WARREN, C. T. ROMBOUGH, T. G. PITTS and M. L. GILBERT, *Nucl. Sci. Eng.*, 1984, **88**, (4), 486-494

Two assemblies of self-powdered in-core detectors have been tested in a pressurised water reactor for over one year. The assemblies contain both prompt responding Hf and delayed-responding Rh detectors. 4 Hf detectors were paired with 4 Rh detectors in each assembly. The Rh detectors were used to calibrate the Hf detectors on line.

### Platinum Group Metals in Hydrogen Storage Materials

STUDIENGESELLSCHAFT KOHLE m.b.H.

*German Offen.* 3,247,360

A useful H storage material is made by doping Mg hydride with a transition metal which may be Pt, Pd, Rh or Ir, among others.

## ELECTROCHEMISTRY

### Semiconductor Electrode

FUJITSU LTD. *European Appl.* 127,281

An electrode has a three layer structure consisting of a contact layer (such as Pt silicide), an intermediate refractory layer and a surface layer (of Pt, Au, etc.).

### Mixed Cyanide Functional Electrode

K.K. DAINI SEIKOSHA *U.S. Patent 4,451,348*

A functional electrode for use as an electrochromic display electrode or as a catalytic electrode for O<sub>2</sub> or Cl<sub>2</sub> production consists of a conductor coated with a film of ZM[M'(CN)<sub>6</sub>] or M<sub>4</sub>[M'(CN)<sub>6</sub>]<sub>3</sub> where Z is a Group IA metal, M is trivalent Fe, Ru or Os and M' is the divalent form of the same metal.

### Platinum Group Metal-Coated Cathode

OCCIDENTAL CHEMICAL CORP. *U.S. Patent 4,456,518*

A low H overvoltage Group IA metal halate cell cathode comprises a conductive substrate, an intermediate protective layer such as an intermetallic compound of Ti with a platinum group metal and an overcoating of a mixture of a major portion of Pt and a minor proportion of Rh, Pd, Ir or Os.

### Reduced Platinum Oxide Electrocatalyst

GENERAL ELECTRIC CO. *U.S. Patent 4,457,223*

An apparatus for electrolytic production of halogens has a catalytic electrode which includes partially reduced oxides of at least one of Pt, Ir, Ru, Pd and Os and their alloys (and optionally graphite) heated in the presence of O<sub>2</sub> to stabilise the reduced oxides.

### Polarity Reversing Electrodes

IONICS INC. *U.S. Patent 4,461,693*

The electrodes of a polarity reversing electro dialysis membrane stack are coated, plated or clad with Pt, Ir or Rh or their oxides.

### Electrolytic Electrode

PERMELEC ELECTRODE LTD. *U.S. Patent 4,471,006*

A platinum group metal-base metal oxide catalytic coating, for instance consisting of Ru, Ir and Ti oxides, has greater durability when it is applied to a valve metal body carrying an intermediate coating of Ti and/or Sn oxide plus Ta and/or Nb oxide.

### Electrolysis Cathodes

PERMELEC ELECTRODE LTD. *U.S. Patent 4,473,454*

Cathodes of improved corrosion resistance, for use in the electrolysis of acid solutions, consist of a valve metal substrate spray coated with a material containing at least 10% of W or WC which is then impregnated with a mixture of cathode-active material and an acid-resistant fluorinated resin. The cathode-active material is a platinum group metal and/or their alloys, mixtures or oxides.

## ELECTRODEPOSITION AND SURFACE COATINGS

### Solderable Palladium-Nickel Coatings

E. I. DU PONT DE NEMOURS & CO. *U.S. Patent 4,463,060*

A permanently solderable Pd-Ni electroplated coating formed on an electrically conductive surface has a first alloy layer of 46–82 at.% Pd and 18–54 at.% Ni, covered by a continuous second layer of 96–100 at.% Pd and 0–4 at.% Ni, up to 20Å thick.

### Noble Metal Coated Molybdenum

LICENTIA PATENT-VERWALTUNGS-Gm.b.H. *U.S. Patent 4,464,441*

A Mo disc suitable for use as a semiconductor is about 0.5 to several mm thick and is coated, via an intermediate 0.5–10 μm thick layer of Cr, with a 0.02 μm thick layer of a noble metal such as Pt, Pd, Rh, Ru, Au or Ag.

### Palladium Electroplating

A. T. & T. BELL LABORATORIES *U.S. Patent 4,468,296*

In a high-speed Pd electroplating process, at least part of the Pd is added to the bath as an ammine hydroxide complex such as [Pd(NH<sub>3</sub>)<sub>2</sub>OH]<sub>n</sub>(OH)<sub>n</sub>.

### Plating Activator Coating for Non-Conductors

OKUNO CHEMICAL INDUSTRY CO. LTD. *U.S. Patent 4,469,714*

Normal Sn-Pd salt activation of non-conducting surfaces for subsequent chemical plating is replaced by the application of an activator coating containing an organic binder, a refractory oxide filler and 0.5–20% Pd powder catalyst. One example shows a coating containing 30% epoxy resin plus curing agent, 66% Al<sub>2</sub>O<sub>3</sub> and 1% Pd black.

### High-Temperature Coatings

AVCO CORP. *French Appl. 2,534,932*

Compositions for protecting turbine parts from high-temperature oxidation or thermal fatigue preferably consists of (a) MCrAl, (b) a lanthanide metal and (c) optionally a noble metal preferably Pt and/or a refractory metal.

## LABORATORY APPARATUS AND TECHNIQUE

### Strain Sensor

TOKYO ELECTRIC CO. LTD. *British Appl. 2,142,776A*

A strain sensor has a first conductive layer which constitutes a bridge circuit by coupling a plurality of strain gauge resistors and a new second thinner conductive layer of chemically stable metal such as Pt.

### Iridium Crucibles

W. C. HERAEUS G.m.b.H. *British Appl. 2,142,935A*

Seamless Ir crucibles are made by cold isostatically compacting Ir powder on a mandrel, sintering the blank in stages at successively higher temperatures (while screening the blank from the heating element using Ir sheet or plate), then isostatically hot compacting the sintered blank.

### Gas Detecting Apparatus

NEW COSMOS ELECTRIC CO. LTD. *European Appl. 120,605*

In a gas detector of improved design a semiconductor is placed in close contact with a metallic heating element which may be a film of Pt or Pt alloy formed in a zigzag pattern on an insulating base.

### Sensor for Hydrogen Determination

ORBISPHERE CORP. *European Appl.* 124,818

An electroanalytical sensor has two electrodes separated by an electrolyte and a membrane permeable to H<sub>2</sub> but not electrolyte. The anodic H sensing electrode has a surface of polished Pt metal, such as pure Pt polished to mirror brightness.

### Titration End Point Detection

MITSUBISHI KASEI K.K.K. *European Appl.* 125,693

A pair of Pt wire electrodes are used in a constant DC pulse device for detecting titration end points.

### Oxygen Partial Pressure in Gases

KARL DUNGS G.m.b.H. & CO. *European Appl.* 126,246

A Pd/Pd oxide probe is used in measuring an O<sub>2</sub> partial pressure. The probe may be reversibly oxidised in given conditions of temperature and O<sub>2</sub> partial pressure and this causes a change in its electrical resistance.

### Gas Sensor

CITY TECHNOLOGY LTD. *European Appl.* 126,623

H<sub>2</sub> and CO may be separately measured, without interference from the other gas, by using porous sensing and counter Pt electrodes.

### Hydrocarbon Gas Sensor

SIEMENS A.G. *European Appl.* 131,731

A thin film sensor for hydrocarbon gas impurity detection and measurement is based on a semiconducting W oxide activated with a platinum group metal, such as Pt itself.

### Thick Film Oxygen Sensor

BENDIX CORP. *U.S. Patent* 4,469,626

Sensors for use in I.C. engine exhaust systems are produced by applying Pt leads to a ceramic substrate and printing over the leads with a mixture of TiO<sub>2</sub>, glass frit and Pt.

## HETEROGENEOUS CATALYSIS

### Hydrocarbon Conversion Catalyst

RESEARCH ASSOCIATION FOR RESIDUAL OIL PROCESSING *British Appl.* 2,138,313A

A hydrocarbon conversion catalyst, particularly suitable for the catalytic cracking of heavy oils containing 0.5ppm or more of heavy metal, consists of 3-40% of a crystalline aluminosilicate zeolite, which may be partially ion exchanged with a lanthanide, Pt or Pd and 60-97% of an alumina-magnesia matrix having a magnesia content of 2-50%.

### Carboxylic Acid or Anhydride Production

BP CHEMICALS LTD. *British Appl.* 2,140,004A

A carboxylic acid or anhydride is prepared by reacting, at elevated temperature and superatmospheric pressure, an olefin with CO and a carboxylic acid in the liquid phase and in the presence of a supported Group VIII metal (preferably Rh) catalyst.

### Acetic Acid, Acetaldehyde and Ethanol Production

AGENCY OF INDUSTRIAL SCIENCE & TECHNOLOGY

*British Appl.* 2,142,012A

Acetic acid, acetaldehyde and ethanol are produced by reacting CO with H<sub>2</sub> in the presence of a catalyst combination of Rh, Ir and Li.

### Barium Stabilised Lead Tolerant Catalyst

JOHNSON MATTHEY P.L.C. *British Appl.* 2,142,253A

A process for making Pb tolerant motor vehicle exhaust purification catalysts, consisting of a platinum group metal catalyst supported on Al<sub>2</sub>O<sub>3</sub> is described. The Al<sub>2</sub>O<sub>3</sub> is impregnated with Ba moiety and fired at 400°C or above before subsequent impregnation with the metal catalyst moiety followed by a second firing at 400°C or above.

### Air Purification

TELEDYNE INDUSTRIES INC. *British Appl.* 2,142,325A

A catalyst consisting of a Pd(II) salt and a Cu(II) salt on a support is used to remove H<sub>2</sub>S and/or HCN, present in low concentrations from air, preferably at -20°C to 85°C.

### Hydrocarbon Cracking Catalyst

CHEVRON RESEARCH CO. *British Appl.* 2,142,551A

A catalyst composition for use in the fluid catalytic cracking of S-containing hydrocarbons includes an improved oxidation promoter for converting SO<sub>2</sub> to SO<sub>3</sub>. It consists of Pd or one of its compounds, together with at least one of Pt, Os, Ir, Re and Rh as metal or compound.

### Vapour Phase Ester Hydrogenation

BRITISH PETROLEUM CO. P.L.C.

*European Appl.* 123,517

Alcohols are obtained when carboxylic esters are hydrogenated in the presence of a Rh, Ru or Ni catalyst supported on C with a Group IA, IIA, lanthanide or actinide promoter. In one example methanol is produced from ethyl acetate using a mixture of 8.9% Ru and 13.3% K on graphitised C.

### Supported Platinum Group Phosphides

EXXON RESEARCH & ENGINEERING CO.

*U.S. Patent* 4,454,246

Highly dispersed platinum group metal phosphide crystallites, especially Pt phosphide, supported on C, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>, zeolite, kieselguhr, vermiculite or a Group IVB or VB transition metal refractory oxide, are useful as catalysts for the selective hydrogenation of liquid hydrocarbons or as fuel cell electrodes.

### Hydrogen Oxidation Catalyst

CJB DEVELOPMENTS LTD. and UNIVERSAL MATTHEY PRODUCTS LTD. *U.S. Patent* 4,459,270

H<sub>2</sub> present in moist air is oxidised over a catalyst consisting of an Al<sub>2</sub>O<sub>3</sub>/Sn oxide support impregnated with 0.25-2.5% each of Pt and Pd.

### Liquid Phase Hydrogenation

JOHNSON MATTHEY P.L.C. *U.S. Patent 4,464,482*

A supported interstitial catalyst system suitable for trickle feed three phase reactions (such as the hydrogenation of crotonaldehyde or butyraldehyde) preferably has a noble metal catalyst component, such as a Pd or Ru catalyst, supported on a novel three dimensional wire interstitial support.

### Three Component Hydrocarbon Reforming Catalyst

STANDARD OIL CO. (INDIANA) *U.S. Patent 4,469,812*

Hydrocarbon reforming is catalysed in the presence of up to 80ppm S by a mixture of three different components, a platinum group metal, a Group VIII base metal and Ga, all separately placed on their own acidic oxide carriers.

### Palladium-Loaded Nickel Mica Catalyst

SHELL OIL CO. *U.S. Patent 4,469,813*

A highly active and selective hydroisomerisation catalyst is prepared by heating a Ni synthetic mica montmorillonite with a hydroxy-aluminium chloride and then loading the pillared product with Pd.

### Rhodium Synthesis Catalyst

UNION CARBIDE CORP. *U.S. Patent 4,471,075*

Oxygenated 2C hydrocarbons, such as acetic acid and acetaldehyde, are prepared from syngas in the presence of a Rh catalyst containing Mn and Na. Typically silica gel is used to support up to 25% of active metal with a Na:Rh ratio of 0.01 to 10.

## HOMOGENEOUS CATALYSIS

### Vehicle Seat

METZELER KAUTSCHUK G.m.b.H. *British Appl. 2,137,492A*

A plastics-covered vehicle seat has a textile covering to the inside of which is applied a layer of a flame-resistant polysiloxane which includes Pt.

### Ethylene Glycol and Methanol Production

TEXACO DEVELOPMENT CORP. *British Appl. 2,143,229A*

Low molecular weight oxygenated compounds, and particularly ethylene glycol and methanol, are prepared in good yield by contacting a mixture of CO and H<sub>2</sub> with a catalyst system comprising a Rh-containing compound, an organic ligand and a sulphonium salt, preferably dissolved in a suitable solvent, at an elevated temperature and pressure.

### Catalysed Silicone Rubber Photocuring

MINNESOTA Mng. & Mfg. CO. *European Appl. 122,008*  
The curing of silicone rubber by u.v. radiation instead of heat may also be accelerated by Pt catalysts having a group which may be displaced by irradiation. An aryl Pt diene, such as diphenyl platinum cyclooctadiene, is preferred.

### Carboxylic Acid and/or Ester Production

SHELL INTERNATIONAL RESEARCH Mij.B.V. *European Appl. 124,160*

Acids and/or esters are produced by reacting an alcohol with CO in the presence of a homogeneous Pd-containing catalyst, an I and/or Br source and a N compound containing a =N-CX- group (where X is O or S). Thus acetic acid may be produced in the presence of Pd acetate, CH<sub>3</sub>I and N-methyl pyrrolidone.

### Platinum Hydroformylation Catalyst

SUN TECH INC. *European Appl. 125,055*

A new catalyst for olefin hydroformylation consists of a zerovalent Pt complex of a phosphine, arsine, etc., mixed with a Group IVB halide. Thus propylene may be hydroformylated by Pt(PPh<sub>3</sub>)<sub>4</sub> and SnCl<sub>4</sub>.

### Rhodium Complex in a Catalyst System

C. D. F. CHIMIE SPECIALITES *European Appl. 127,501*

A catalyst system for the hydroformylation of olefins to aldehydes consists of H(CO)Rh(PPh<sub>3</sub>)<sub>3</sub>, PPh<sub>3</sub>, Co<sub>2</sub>(CO)<sub>8</sub> and a conjugated diene derivative such as 2-ethyl-hex-2-enal.

### Urethane Production Catalyst

BAYER A.G. *European Appl. 129,759*

A new catalyst system for the production of urethanes from nitro compounds and hydroxyl compounds consists of (a) at least one noble metal or metal compound, (b) a combination of at least one Fe or Cu oxide or hydroxide with a chloride and (c) at least one organic base. A typical catalyst contains Pd chloride, Fe oxide, ferrous chloride and aniline.

### Carboxylic Ester Production

BRITISH PETROLEUM CO. P.L.C. *European Appl. 132,144*

Carboxylic esters may be obtained from CO, a metal alkoxy and hydrocarbon halide in the presence of a Rh, Ir or Co catalyst. In one example ethyl phenylacetate is obtained from benzyl bromide, Al ethoxy and CO in the presence of hexadiene Rh chloride dimer.

### Alcohol Production from Olefins and Synthesis Gas

STANDARD OIL CO. (OHIO) *U.S. Patent 4,456,694*  
Olefins, CO and H<sub>2</sub> are catalytically reacted to produce alcohols in a single step reaction using a catalyst of formula M<sub>x</sub>RhO<sub>x</sub> where M is Fe, Zn, Ir, Ru, Nb, Cr, Mn and/or Pt, a is 0.001-10 and x is >0 but less than the number required for full oxidation of the other elements.

### Photocatalysts for Amine Production

PENNWALT CORP. *U.S. Patent 4,459,191*  
A process for making amines by reacting NH<sub>3</sub> or a primary or secondary amine with olefins under the action of u.v. light may be catalysed, for example, by RuCl<sub>2</sub>(PPh<sub>3</sub>)<sub>3</sub> or RhCl(PPh<sub>3</sub>)<sub>3</sub>.

## Hydrogen Peroxide Production

HALCON SD GROUP INC. *U.S. Patent 4,462,978*  
H<sub>2</sub>O<sub>2</sub> is produced from CO, O<sub>2</sub> and H<sub>2</sub>O at -78 to +150°C in the presence of an organic solvent which is a carbonyl compound or nitrile. The catalyst is a platinum group metal such as Pd chloride, Ru trichloride, Rh chloride hydrate, Pt chloride or graphite supporting Pt, Pd or Ru.

## ABS Polymer Hydrogenation

JOHNSON MATTHEY P.L.C. *U.S. Patent 4,469,849*  
ABS polymers are hydrogenated in emulsion by contacting the copolymer with H<sub>2</sub> and a catalyst dissolved in a solvent. The catalyst is RhCl(PPh<sub>3</sub>)<sub>3</sub>, [(PPh<sub>3</sub>)<sub>2</sub>Rh(CoD)]<sup>+</sup>[BF<sub>4</sub>]<sup>-</sup>, RhH(CO)(PPh<sub>3</sub>)<sub>3</sub> or RhH(CO)(PPh<sub>3</sub>)<sub>2</sub>. The solvent is immiscible in the liquid forming the emulsion and also acts as a swelling agent for the copolymer increasing accessibility of the catalyst to the double bonds. Once the reaction is completed the two layers, one containing the catalyst and the other the polymer, are easily separated.

## Linear Alcohols from Olefins

TEXACO INC. *U.S. Patent 4,469,895*  
A new catalyst for the production of alcohols from olefins (such as nonanols from octene) consists of a Ru compound and an amine promoter dispersed in a low melting quaternary phosphonium salt.

## Dimerisation Catalyst

INSTITUT KHIMII BASHKIRSKOGO FILIALA AN SSSR  
*Russian Patent 1,097,588*  
A catalyst for the cyclodimerisation of vinyl acetylene to styrene consists of Pd acetylacetonate, triphenyl phosphine and Al triethyl in the molar ratio 1-3:2-4:1-3.

## FUEL CELLS

### High Pressure Fuel Cell

PRUTEC LTD. *European Appl. 124,275*  
A high pressure cell is made with electrodes formed as thin films deposited on thin film porous membranes. Typically an electrode is formed by a layer of Pt 200-1000Å thick.

### Fuel Cell Electrodes

ELECTROCHEMISCHE ENERGIECONVERSIE N.V.  
*European Appl. 126,511*  
The porous catalyst layer on an electrode is made from a binder mixture of 3-30 parts mouldable polymeric binder, 50-94 parts C particles and 3-47 parts hard hydrophobic polymer particles. In an example the C particles contain 5% Pt.

### Negative Hydrogen Electrode

R.C.A. CORP. *U.S. Patent 4,460,660*  
An electrode suitable for use in a Ni-H fuel cell is based on a support structure carrying an alloy consisting of equal quantities of Pd and Ru (to 1 or 2%).

## Fuel Cell

W. R. GRACE & CO. *U.S. Patent 4,463,065*  
The solid electrolyte of a fuel cell is made of yttria-stabilised zirconia or Ca-stabilised zirconia, an O-dissociating catalyst comprising Pt or a Pt-Rh alloy and a reaction-promoting catalyst also comprising Pt or a Pt-Rh alloy.

## CHEMICAL TECHNOLOGY

### Photographic Material

FUJI PHOTO FILM CO. LTD. *U.S. Patent 4,452,882*  
A light-sensitive material which has a good letter image aptitude and which can be handled in a bright room is a specified Ag halide emulsion containing a small proportion of a water-soluble Rh salt.

## GLASS TECHNOLOGY

### Bushing Tip Preparation

P.P.G. INDUSTRIES INC. *U.S. Patent 4,461,191*  
A method of supplying tips for a glass fibre forming bushing is provided which involves mating the tips to a hole in a bushing plate, applying pressure to the tip sidewalls against the plate to firmly seal them followed by a high temperature treatment to form a homogeneous metal bond. The bushings are typically made of Pt-Rh alloys.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### Radioactive Krypton Fixation

DEUTSCHE GESELLSCHAFT FÜR  
WIEDERAUFARBEITUNG VON KERNBRENNSTOFFEN  
m.b.H. *British Appl. 2,142,466A*  
In fixing radioactive Kr by sputtering embedding metal, so as to deposit it on a suitable substrate in the presence of a Kr plasma, the sputtering electrode which forms the embedding metal comprises a radioactive metal, such as Pd, Ru or Rh.

### Recording Element

EASTMAN KODAK CO. *European Appl. 120,167*  
An electrically activatable recording element for forming a non-Ag positive image consists of an electrically conductive support on which is deposited an electrically activatable layer of Pd(NH<sub>3</sub>)<sub>4</sub>Cl<sub>2</sub> dispersed in a butylacrylate-sodium-2-acrylamido-2-methylpropane sulphonate copolymer.

### Connector Using a Shape Memory Alloy

HITACHI LTD. *European Appl. 123,376*  
A connector has thin sheets of shape memory alloy located on a substrate surface and placed over holes in the substrate. A pin is inserted in the hole, penetrating the sheets, at a temperature where the sheets are easily deformed. The temperature is changed so that sheets regain their shape and create a good electrical connection. The alloy may be a Pt or Ag alloy, among others.

## Screen Printable Resistor Paste

N.V. PHILIPS' GLOEILAMPENFABRIEKEN

*European Appl.* 124,948

A paste for producing printed resistors consists of a mixture of  $Pb_2Rh_xRu_{2-x}O_{7-y}$ , where  $x$  is up to 0.95 and  $y$  is up to 0.5, a glass or other binder, a temporary binder and a solvent. The use of a borosilicate glass, for example, in the resistor enables the T.C.R. to be held at  $-10$  to  $+10 \times 10^{-6}/^{\circ}C$ .

## Print Head

ING. C. OLIVETTI & CO. S.P.A. *European Appl.* 129,330

A specified ink jet print head incorporates an  $Al_2O_3$  base plate on which is deposited a thick film strip of conductive noble metal, preferably Pt.

## Diesel Glow Plug

BENDIX CORP.

*European Appl.* 129,676

A glow plug is made from a hollow cylindrical metal shell with a protruding heater member. The member has a non-conductive cylindrical substrate coated with a surface heating film made of platinum group metal or its alloy, such as Pt. The new construction reduces the exposure of the film to high temperatures.

## Electrochromic Display Device

CITIZEN WATCH CO. LTD. *U.S. Patent* 4,451,498

An anodic electrochromic layer is formed on a transparent electrode by ion plating Ir, Rh or Ni on the electrode to form an oxide film.

## Semiconductor Devices

TEXAS INSTRUMENTS INC.

*U.S. Patent* 4,455,738

A metal deposited on a prepared Si substrate and converted to the metal silicide (in a method for fabrication of a MESFET device) is preferably Pt.

## Semiconductor Strain Gauge

GULTON INDUSTRIES INC.

*U.S. Patent* 4,462,018

A semiconductor transducer having integral compensation resistors includes Pt alloy resistors formed on a  $SiO_2$  layer and Au conductive lines interconnecting the resistors.

## Glass Frits for Ruthenium Dioxide Resistors

CORNING GLASS WORKS

*U.S. Patent* 4,464,421

Thick film  $RuO_2$ -based resistors (T.C.R. < 100 ppm) are made by mixing  $RuO_2$  powder with a glass frit containing in mol%, 32-39%  $PbO$ , 44-47%  $B_2O_3$ , 14-17%  $SiO_2$ , and an effective amount up to 5% of  $WO_3$  or  $MoO_3$ . The heat treatment of the frit is intended to crystallise  $PbWO_4$  or  $PbMoO_3$  in situ.

## Sparking Plug

NIPPONDENSO CO. LTD. and TOYOTA JIDOSHA

KOGYO K.K.

*U.S. Patent* 4,465,952

In a sparking plug of more economical design only the tips of the electrodes are made from a noble metal which may be Pt, Pd, Ir or Au.

## Thin Film Capacitor Electrode

INTERNATIONAL BUSINESS MACHINES CORP.

*U.S. Patent* 4,471,405

A capacitor has a dual bottom electrode including a first layer of metal and a second layer of Pt. The metal, such as Hf, Zr or Ta, must form a stable inter-metallic phase with Pt during heat treatment.

## MEDICAL USES

### Palladium Dental Alloy

DEGUSSA A.G.

*European Appl.* 124,750

Casting alloys for bridges, crowns, plates, etc., contain 65-85% Pd, 0-10% Au and/or 0-5% Pt, 0.1-10% Sn, 1-10% Ga, 1-12% Cu and 0.05-1.5% Ru and/or 0.05-0.7% Re.

### Cochlear Implant System

AUSTRALIAN DEPARTMENT OF SCIENCE & TECHNOLOGY *European Appl.* 124,930

Multiple Pt ring electrodes are used in a silastic carrier to be implanted in the cochlea of the ear.

### Sensing Device

DIAMOND SHAMROCK CHEMICALS CORP.

*European Appl.* 125,807

A transcutaneous blood  $CO_2$  and pH sensor has a Pd/Pd oxide junction as an active electrode and an Ag/Ag halide reference electrode applied to a non-conducting substrate and covered with a dielectric and a polymeric membrane.

### Medical Electrode

MEDTRONIC INC.

*European Appl.* 126,981

A low-polarisation, low-threshold electrode particularly suitable for cardiac pacing is Pt coated.

### Magnetic Orthodontic Appliances

MEDICAL MAGNETICS INC. *European Appl.* 127,710

PtCo, SmCo and other similar magnetic materials are used in integrated oral magnetic osteogenic and orthodontic appliances.

### Diaminocyclohexane Platinum Complexes

RESEARCH CORP.

*European Appl.* 130,482

New complexes for tumour treatment are 1:1 diaminocyclohexane Pt(II) complexes containing two anions of a monocarboxylic acid or sulphonic acid or one anion of a dicarboxylic acid, for example a bis-prolinate or bis-isethionate or a monofuran dicarboxylate.

### Dental Alloy

JENERIC INDUSTRIES INC.

*U.S. Patent* 4,451,639

An alloy for fusion to porcelain in dental restoration contains 35-85% Pd, 0-12% Cu, 5-15% Ga, 0-50% Au, 0-13% Co, 0.1-0.5% Ru and/or Re, up to 5% Al and up to 0.5% Zn. A typical alloy contains about 78.6% Pd, 10% Cu, 9% Ga, 2% Au, 0.1% Al, 0.1% Zn and 0.2% Ru and/or Re.