

# NEW PATENTS

## METALS AND ALLOYS

### Tarnish Resistant Alloy

PENNWALT CORP. *U.S. Patent 3,767,391*

A tarnish-resistant alloy, especially useful in the presence of S and S-containing environments, contains 39–47% Au, 9–12% Pd and the balance Ag and Cu with a Ag:Cu ratio of 1:1 to 1.5:1.

### Radioisotopic Heat Source

U.S. ATOMIC ENERGY COMMISSION

*U.S. Patent 3,767,930*

A radioisotopic heat source includes a core of heat-productive, radioisotopic material, an impact-resistant layer of graphite surrounding the core and a shell of Ir metal between the core and the impact layer.

### Bright Cast Alloy

WILLIAMS GOLD REFINING CO.

*U.S. Patent 3,769,006*

An improved Au alloy casting composition has sufficient Al and/or Si to form a lustrous oxidation-resistant surface coating during and after casting. Typically 0.08–0.32% Al is added to a Au dental alloy containing 3% Pd, 8% Pt, <1% In and Sn and 0.25% Fe.

## CHEMICAL COMPOUNDS

### Organic Palladium Compounds in Organic Synthesis

HERCULES INC.

*U.S. Patent 3,783,140*

An organic group is introduced into an ethylenically unsaturated carboxylic acid using an organic Pd complex formed in situ. In an example, a mixture of phenyl mercuric chloride, Li Pd chloride and acrylic acid is formed in acetonitrile as solvent. This results in the formation of an unstable adduct between the acrylic acid and phenyl Pd chloride.

## ELECTROCHEMISTRY

### Rhodium and Molybdenum Mixed Oxide

SOLVAY ET CIE.

*U.S. Patent 3,773,915*

An oxidic compound of Rh and Mo of empirical formula  $Rh_2MoO_6$ , having semiconducting properties, is suitable for coating electrodes.

## ELECTRODEPOSITION AND SURFACE COATINGS

### Rhodium Plating Bath

AMERICAN CHEMICAL & REFINING CO. INC.

*British Patent 1,346,753*

A bright deposit of improved properties is

obtained from a bath containing 1.0–30 g/l Rh ions, 0.05–5.0 g/l Al ions, 50–400 g/l sulphamic acid and 1.0–25 g/l of a polybasic organic carboxylic acid.

### Chemical Plating Sensitiser

RCA CORP.

*British Patent 1,348,793*

The chemical deposition of Pt, Pd, Au, Co, Cu, Ni, etc., on non-conducting surfaces, such as plastics materials, may be sensitised by treatment with a solution containing both divalent and tetravalent tin ions. In one example a solution of  $SnCl_2$  and  $SnCl_4$  is used to treat a plastics surface before a Pd catalyst for chemical Ni plating is deposited.

### Chemical Plating of Polypropylene

DIAMOND SHAMROCK CORP.

*British Patent 1,348,842*

In order to enable polypropylene to be plated using a conventional  $SnCl_2$ -PdCl<sub>2</sub> pretreatment, a small amount of a phenolic compound and/or resin compound is added.

### Sensitising for Chemical Plating

KOLLMORGEN CORP.

*British Patent 1,349,666*

A solid sensitising composition that readily dissolves to a clear solution contains a Pt group metal, a Group IV metal and an anion capable of forming a stable compound with both valencies of the Group IV metal. The ratio of the three components varies from 1:1:3 to 1:6:24. The preferred metals are Pd and Sn.

### Undercoat for Rhodium Plating

AMPEX CORP.

*U.S. Patent 3,767,369*

Rh-plated articles are given superior wear qualities by providing an undercoating of a Sn-Ni alloy. The undercoat is particularly applicable for metallic discs having a magnetic coating used for data or TV recording. The amount of Rh used may also be reduced.

### Deposition of Metals or Oxides on a Metallic Support by Cathodic Sputtering

PROGIL

*U.S. Patent 3,773,639*

A precious metal or its oxide is deposited on a metallic support by first submitting the metallic support to ionic bombardment in a rare gas atmosphere, then, without cooling below 300°C, depositing the precious metal by cathodic sputtering conducted first in a rare gas atmosphere and then in an atmosphere of mixed O<sub>2</sub> and rare gas. Pt can be deposited on Ti in this way to provide electrolysis electrodes.

### Selectively Depositing a Metal on a Substrate

WESTERN ELECTRIC CO.

*U.S. Patent 3,775,121*

Selective chemical plating is achieved by sensitising

ing the substrate surface and depositing an activator such as Pd. The activator is poisoned to destroy its activity. UV radiation through a mask or image is used to reactivate the activator only in selected areas. The activator is available to bring about chemical plating of those areas.

### Electrodeposition of Rhodium

BELL TELEPHONE LABORATORIES INC.

*U.S. Patent 3,775,267*

Plating with a soluble Rh electrode is achieved by maintaining a constant Rh concentration in the electrolyte, the continuous dissolution of the Rh anode being effected by imposing a pulsed signal on to it.

## JOINING

### Titanium Brazing Alloy

ALLOY METALS INC.

*U.S. Patent 3,778,258*

A strong, ductile, corrosion-resistant alloy suitable for brazing Ti and Ti-based alloys contains about 3-30% Al, about 3-17% Pd and about 55-95% Ag.

### Platinum-based Weldable Material

COMPTOIR LYON-ALEMAND-LOUYOT

*French Patent 2,171,659*

A Pt-based welding material comprises PtO<sub>2</sub> and 0.005-0.2% (based on the PtO<sub>2</sub>) of Y; it may also contain at least one lanthanide oxide.

## HETEROGENEOUS CATALYSIS

### Catalytic Composite

UNIVERSAL OIL PRODUCTS CO.

*British Patent 1,345,611*

A complex catalyst for hydrocarbon conversion is produced by dissolving GeCl<sub>4</sub> in an anhydrous alcohol, equilibrating the solution and mixing it with an aqueous Pt metal solution. The product is used to impregnate a porous support, e.g.  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>. After firing, the support should contain 0.01-5% Ge, 0.01-2% Pt group metal and 0.5-4% Cl<sub>2</sub>. Pt itself is preferred.

### Dehydrogenation Catalyst

UNIVERSAL OIL PRODUCTS CO.

*British Patent 1,345,612*

A dehydrogenation catalyst is formed by mixing an alcoholic Ge tetrahalide solution with aqueous solutions of a Pt group metal compound and an alkali metal compound. The mixture is used to impregnate a porous support such as Al<sub>2</sub>O<sub>3</sub>. Preferably the catalyst after calcining contains 0.05-5% Ge, 0.05-5% Pt and 0.01-1.5% Li.

### Hydrogenation of Hydrocarbon Resins

EASTMAN KODAK CO.

*British Patent 1,345,619*

Petroleum resins produced by the polymerisation of unsaturated feedstocks over metal chlorides are

improved by hydrogenation, preferably in the presence of a Pd catalyst.

### Hydrogen Cyanide Production

E.I. DU PONT DE NEMOURS & CO.

*British Patent 1,345,785*

HCN is produced in the vapour phase by the reaction of O<sub>2</sub>, NH<sub>3</sub> and a hydrocarbon over a Pt group metal catalyst, especially a gauze made from an alloy of Pt with up to 20% Rh.

### Platinum Metal Catalysts

SHELL INTERNATIONALE RESEARCH MIJ. N.V.

*British Patent 1,348,653*

Where Sn accompanies Pt (or another Pt group metal) in a supported hydrocarbon conversion catalyst, a more active catalyst is produced when the Sn is supplied to the support as a stannate ion. For example Al<sub>2</sub>O<sub>3</sub> may be impregnated using a Pt salt solution and a Na stannate solution.

### Acetic Acid Production

NATIONAL DISTILLERS & CHEMICAL CORP.

*British Patent 1,349,100*

C<sub>2</sub>H<sub>4</sub> is oxidised to CH<sub>3</sub>COOH in the presence of added H<sub>2</sub>O and a supported catalyst containing Pd metal and H<sub>3</sub>PO<sub>4</sub>. Al<sub>2</sub>O<sub>3</sub> and C supports are mentioned in the examples and they carry 0.01-5% Pd and at least 2% H<sub>3</sub>PO<sub>4</sub>.

### Ruthenium Catalyst

DIAMOND SHAMROCK CORP. *U.S. Patent 3,766,089*

An improved Ru catalyst is prepared by impregnating a catalyst support with a RuCl<sub>3</sub> solution, drying the impregnated support and then partially reducing the dried RuCl<sub>3</sub> coating on the support. The catalyst is useful in the hydrogenation of the pyrroles. Spent catalyst can be rejuvenated by recoating with RuCl<sub>3</sub> solution, drying the coated spent catalyst and then partially reducing the RuCl<sub>3</sub> coating.

### Auto Emission Catalyst

AIR PRODUCTS & CHEMICALS INC.

*U.S. Patent 3,770,659*

The active catalyst for burning exhaust gases from an internal combustion engine consists essentially of a sorptive Al<sub>2</sub>O<sub>3</sub> matrix, 5-18% MnO, 2-8% Cr<sub>2</sub>O<sub>3</sub> and 0.01-0.2% Pd, the unit weight ratio of MnO to Cr<sub>2</sub>O<sub>3</sub> being 2-3.5 and the total weight of such oxides being 8-24%.

### Preparation of a Catalytic Composite

UNIVERSAL OIL PRODUCTS CO.

*U.S. Patent 3,772,213*

A Pt group component and a Ge component are uniformly dispersed throughout a porous high surface area carrier material by treating a GeCl<sub>4</sub>/anhydrous alcohol solution with an aqueous solution of a H<sub>2</sub>O-soluble, decomposable compound of a Pt group metal and using this as the impregnation solution.

### Hydrocarbon Isomerisation Process

UNIVERSAL OIL PRODUCTS CO.

*U.S. Patent 3,772,397*

Hydrocarbons are isomerised using a catalytic composite comprising a combination of a Pt group component and a Sn component with a porous carrier material, e.g. 0.75% Pt and 0.5% Sn on  $\gamma$ - $\text{Al}_2\text{O}_3$ .

### Hydrocracking Process

SUN OIL CO. OF PENNSYLVANIA

*U.S. Patent 3,775,297*

Fresh gas oils are converted to high quality motor fuels and naphthenic lubricating oils by hydrocracking at 720–750°C in the presence of crystalline zeolite hydrocracking catalyst containing a hydrogenating component, e.g. Pd, the catalyst having been preconditioned to a predetermined state of deactivation. Preconditioning is accomplished by accelerated coking with an aromatic gas oil at 800–900°F. The preferred catalyst consists of 0.1–1% Pd on a Y-zeolite.

### Hydrocarbon Conversion with a Catalytic Composite of Platinum, Iron and Germanium

UNIVERSAL OIL PRODUCTS CO.

*U.S. Patent 3,775,300*

Hydrocarbons are converted by contacting them with a catalytic composite of a Pt group metal component, an Fe component and a Group IVA metallic component with a porous carrier material, e.g. 0.375% Pt, 0.5% Ge and 0.1% Fe on  $\text{Al}_2\text{O}_3$  containing 0.85%  $\text{Cl}_2$ .

### Hydrocarbon Conversion with a Trimetallic Catalytic Composite

UNIVERSAL OIL PRODUCTS CO.

*U.S. Patent 3,775,301*

Hydrocarbons are converted by contacting them with a combination of a Pt group metal component, a Re component and a Ge component with a porous carrier material, e.g. 0.1% Re, 0.2% Ge and 0.5% Pt on  $\text{Al}_2\text{O}_3$  containing 0.85%  $\text{Cl}_2$ .

### Dehydrocyclisation of Paraffins

SUN RESEARCH & DEVELOPMENT CO.

*U.S. Patent 3,775,502*

A Na zeolite X or Na zeolite Y, is ion-exchanged with from 0.10–1.2% Pt. The catalyst is calcined and the Pt then reduced with  $\text{H}_2$  to the free metal to catalyse the dehydrocyclisation of 6–10C paraffins.

### Reforming Catalyst

CITIES SERVICE OIL CO.

*U.S. Patent 3,776,860*

An improved reforming catalyst has an  $\text{Al}_2\text{O}_3$  support impregnated with Pt, Re and a rare earth metal. Preferably the catalyst composition comprises Pt, Re and rare earth metals such as Nd, Pz, Sm and Yb each in amounts of from 0.1–5%.

### Platinum and Lead Catalyst

ASAHI KASEI K.K.K.

*U.S. Patent 3,781,221*

Selective reforming catalysts contain an  $\text{Al}_2\text{O}_3$  carrier, with pores of a diameter distribution having a peak in the range of 2,000–7,000Å supporting Pt and Pb. The pores are obtained by burning out an organic material used in shaping the catalyst support.

### Hydrocarbon Conversion Catalyst

STE. FRANCAISE DES PRODUITS POUR CATALYSE

*French Patent 2,164,986*

A hydrocarbon conversion catalyst consists of an  $\text{Al}_2\text{O}_3$ -supported mixture of Pt, Ir and Sc, Y, Ac, Ti, Zr, Hf, Th, Ge, Sn or Pb, e.g. 0.2% Pt, 0.05% Ir and 0.5% Th. In *French Patent 2,165,056* the third element is 0.5% of U, Pa, Ga, V, or Tc.

### Carbon Catalyst Supports

STE. RHONE-PROGIL

*French Patent 2,165,280*

Active C is treated with an aqueous solution of a volatile acid, e.g. HCl, and dried before treatment with a mineral base such as NaOH. This dual treatment is said to improve the catalyst support properties. In one example this support is impregnated with  $\text{RhCl}[\text{P}(\text{OPh})_3]_3$ .

### Catalyst

JOHNSON, MATTHEY & CO. LTD.

*German Offen. 2,229,210*

A catalyst for the treatment of exhaust gases and for production of  $\text{CH}_4$  by the steam reforming of naphtha comprises a refractory support coated with a first layer of one or more oxides of Ti, Zr, Hf and Th and a final layer of a mixture or alloy of Pt, Rh (1–50%) and optionally base metal (0.01–25%). Preferably the base metal is Ni or Cu and the final coating contains 0.01–10% by weight of the total metal content.

### Dehalogenation Catalysts

KNAPSACK A.G.

*German Offen. 2,240,466*

The dehalogenation of organic compounds, especially the dechlorination of polychloroacetic acids, is catalysed by a supported Pd catalyst in which the Pd is enriched on the surface.

### Zeolitic Catalyst

SHELL INTERNATIONALE RESEARCH MIJ, N.V.

*Dutch Appln. 72. 11,593*

Catalysts for selective hydrocracking and other reactions are prepared by a specified system of heat treatment of a cation-exchanged zeolite, such as KS 01, on which a metal, such as Pd, Pt, Ru and Rh (among others), is deposited.

### Ketone Production Catalyst

SHELL INTERNATIONALE RESEARCH MIJ, N.V.

*Dutch Appln. 72. 11,914*

Ketones are produced by the reaction of mercaptans with  $\text{H}_2\text{O}$  in the presence of a supported

Group VB, VIB and/or Mn sulphide catalyst promoted by a Group VIII metal such as Rh or Ir. In one example butanethiol-2 is converted to butanone-2 in the presence of a sulphided mixture of Mo and Rh on  $Al_2O_3$ .

## HOMOGENEOUS CATALYSIS

### Olefin Production

IMPERIAL CHEMICAL INDUSTRIES LTD.

*British Patent 1,344,887*

*British Patent 1,278,806* describes a process in which 1,6- and/or 1,7-octadienes are produced by contacting one or more acyclic conjugated dienes with metallic Pt, Pd, Rh, Ru, or Os in a polar solvent. It has now been found that the process may also be carried out in a non-polar solvent such as  $C_6H_6$ .

### Adipic Acid Production

BADISCHE ANILIN- & SODA-FABRIK A.G.

*British Patent 1,348,800*

Butadiene is reacted with CO and  $H_2O$  to give adipic acid in the presence of a Rh catalyst activated with an organic halide in the absence of acid. Thus  $Rh(CO)_2Cl$  can be used in the presence of  $CH_3I$  (used in all the four examples).

### Silicon Rubber Production

GENERAL ELECTRIC CO. *British Patent 1,349,311*

New Si rubbers are produced from silyl isocyanurates in whose production Pt catalysts may be used for the silylation reaction.

### Platinum Complexes of Unsaturated Siloxanes

GENERAL ELECTRIC CO. *U.S. Patent 3,755,452*

Pt complexes of unsaturated siloxanes are provided which are useful as hydrosilation catalysts. These Pt-siloxane complexes can contain an average of up to  $\sim 1$  g. atom of halogen per g. atom of Pt, but include complexes which are substantially free of inorganic halogen.

### Production of Alcohols

UNION OIL CO. OF CALIFORNIA

*U.S. Patent 3,766,279*

Aldehydes are converted to higher molecular weight alcohols by simultaneous aldol condensation and hydrogenation reactions which are catalysed by a Ru-biphyllic ligand catalyst, e.g.  $RuCl_3(PPH_3)_3$ .

### Activator Solutions for Electroless Plating

ENTHONE INC.

*U.S. Patent 3,767,583*

Surfaces intended to be electrolessly metal plated are treated with a colloidal catalyst metal-free acid liquid solution of a soluble, Lewis base-modified noble metal-Sn halide complex until the surface becomes catalytic, e.g. a  $PdCl_2-SnCl_2-CH_3OH$  complex.

### Alcohol Amine Interchange

UNION OIL CO. OF CALIFORNIA

*U.S. Patent 3,767,709*

A tertiary amine is reacted with an alcohol or aldehyde in a liquid reaction medium containing a Ru, Os, Re, or Tc catalyst which is preferably in complex association with a biphyllic ligand to interchange the hydrocarbonyl portions of the reactants. In a typical process tributylamine is contacted with octanol in the presence of  $RuCl_3$  and  $Ph_3P$  to produce butanol and octyl dibutylamine. Aldehydes can be similarly reacted under  $H_2$  pressure.

### Oxidation of $\alpha$ -Aryl Alcohols

UNION OIL CO. OF CALIFORNIA

*U.S. Patent 3,769,325*

Aryl alcohols or their ethers are oxidised to aldehydes, ketones or esters using Group VIII arsine, phosphine, stibine or bismuthine complexes, e.g. a  $RhCl_3$  or  $PdCl_2-Ph_3P$  complex.

### Redox Catalyst System for Ethylene-Vinyl Grafted Copolymer Dispersions

WACKER-CHEMIE G.M.B.H. *U.S. Patent 3,773,699*

K persulphate, a Pd salt and ammonium ferric sulphate are used as a redox system for graft copolymerising EVA emulsions with vinyl chloride or another monomer.

### Process for Benzyl Ketones

STANDARD OIL CO.

*U.S. Patent 3,773,837*

Benzyl ketones are produced in a one-step process by reacting  $C_6H_6$  with a ketone at elevated temperatures in the presence of a divalent Pd salt of a carboxylic acid and a strongly acidic catalyst.

### Preparation of Unsaturated Esters

ESSO RESEARCH & ENGINEERING CO.

*U.S. Patent 3,775,469*

Unsaturated esters are prepared through the reaction of a 4-6C aliphatic conjugated diene with a carboxylic acid in the presence of a Pd catalyst, or organic phosphine or phosphite ligand modifier and a promotor compound such as  $NaBH_4$  or acetic anhydride. The reaction is carried out in the absence of tertiary amines and in the substantial absence of  $O_2$ . Pd acetylacetonate is used in the examples.

### Platinum or Palladium Phosphinite Catalysts

E. I. DU PONT DE NEMOURS & CO.

*U.S. Patent 3,776,929*

Compounds of formula  $(L)_2MXY$ , where L is a phosphinite, phosphonite, thiophosphinite or dithiophosphonite ligand, M is Pd or Pt, and X and Y are alike or different and are selected from Cl, Br, I, various substituted and unsubstituted alkyls and aryls, cyano,  $SnCl_3$ , isocyanate, thiocyanate, aroyl, and lower perfluoroalkyl

groups are produced by reacting one equivalent of a source of MXY with two or more equivalents of a selected P-containing ligand. The products, e.g.  $\text{PtCl}_2$ -(dimethyl phenyl phosphinite) are useful in the alkoxy-carbonylation of olefins and in the polymerisation of acetylene.

#### Preparation of Alkadienoic Acid Esters

ESSO RESEARCH & ENGINEERING CO.

*U.S. Patent 3,780,074*

Esters of alkadienoic acids are prepared through the reaction of 4-12C aliphatic, acyclic, conjugated diolefins with a 1-20C monohydroxy alcohol and either gaseous CO or gases containing CO in the presence of a catalyst system including zerovalent Pd, e.g.  $\text{Pd}(\text{PPh}_3)_4$ .

#### Synthesis of Pyridine Bases

YAWATA CHEMICAL INDUSTRY CO. LTD.

*U.S. Patent 3,781,292*

Pyridine bases are produced by reacting olefins with  $\text{NH}_3$  in the presence of a Pd tetrammine complex whose activity is enhanced by means of a Cu (II) salt and  $\text{O}_2$ . Thus  $\text{PdCl}_2$ ,  $\text{NH}_3$  and  $\text{CuCl}_2$  may be used in picoline production.

#### Preparation of Aromatic Isocyanates

OLIN CORP.

*U.S. Patent 3,781,321*

The complex  $\text{PdL}(\text{CO})\text{X}_2$ , where L is a heterocyclic N compound such as lutidine and where X is a halogen, is prepared by reacting CO with a Lewis base and a Pd dihalide and/or a mixture of elementary Pd with an acid halide, in the presence of a liquid reaction medium. The resulting complex is useful as a catalyst in the preparation of organic isocyanates by reacting CO with an organic nitro compound.

#### Preparation of $\alpha$ -Hydroxyamides

UNION OIL CO. OF CALIFORNIA

*U.S. Patent 3,781,351*

Formamide or a substituted formamide is reacted with a 2-12C carbonyl compound in a liquid reaction medium containing a Ru or Os catalyst, preferably complexed with a biphilic ligand, at 50-300°C to form an  $\alpha$ -hydroxyamide. In a typical process formamide is reacted with an excess of benzaldehyde in the liquid phase in the presence of  $\text{RuCl}_3$  complexed with triphenyl phosphine to produce  $\alpha$ -hydroxyphenyl acetamide.

## FUEL CELLS

#### Fuel Cell Electrode

UNITED AIRCRAFT CORP.

*U.S. Patent 3,755,947*

A fuel cell electrode has an anodic catalyst including Pt and Rh oxides and a Ni, Co, Fe, or Cu oxide together with a component convertible to W oxide to provide high electrical performance at very low noble metal loadings. A typical mixture of oxides contains 2g Pt, 0.1g Rh and 1.9g Ni.

#### Fuel Cell Electrode

STUDIECENTRUM VOOR KERNENERGIE

*Dutch Appln. 72.14,900*

A fuel cell electrode has an electrically conducting metal grid with a catalyst-containing coating which has one or more layers varying in porosity. The catalyst layer, for example, consists of ptf particles forming a matrix containing Pd, Pt or Ag catalyst.

## CHEMICAL TECHNOLOGY

#### Preparing Radiation Source Material

U.S. ATOMIC ENERGY COMMISSION

*U.S. Patent 3,773,295*

A uniform dispersion of a radioisotope within a noble metal matrix is provided by chemically plating a noble metal coating on to particles including a dissociable compound of the radioisotope. For example, Pd in the presence of  $\text{H}_2$  can be deposited on Cf oxalate particles containing Cf-252. The coated particles are dried and the oxalate decomposed to Cf oxide.

#### Diffusion Cell

JOHNSON, MATTHEY & CO. LTD.

*U.S. Patent 3,782,077*

A  $\text{H}_2$  diffusion unit for separating mixtures from gaseous mixtures containing  $\text{H}_2$  has two superimposed metal foils such as Ag/Pd foils, bonded together at their edges to form an envelope. At least one of the foils is corrugated or undulated and each corrugation or undulation is supported by a helix of stainless steel or like wire.

#### Fogged, Direct-positive Silver Halide Emulsion Layer

FUJU PHOTO FILM CO. LTD. *U.S. Patent 3,782,957*

Pt group metal compounds such as  $\text{K}_3\text{RuCl}_6$  are used with methine dyes in photographic sensitisation.

## GLASS TECHNOLOGY

#### Glass Feeders

OWENS-CORNING FIBER-GLASS CORP.

*British Patent 1,350,644*

New alloys for glass feeders consist of 14-85% Pt, 15-85% Rh and 0.1-1% of an additional metal selected from Mo, W, Ir, and Re in an amount only sufficient to increase the ductility of the alloy.

#### Alloy Glass Fibre Forming Bushing

J. H. HANSEN & R. W. BETZ

*U.S. Patent 3,773,728*

A high temperature-high strength alloy containing Pt, Rh and one or more of Mo, W, Ir, and Re is fabricated into apparatus adapted to receive and controllably emit molten material for attenuation into glass fibres. One example of the alloy contains 79% Pt, 20.99% Rh and 0.01% Mo.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### Resistors

OWENS-ILLINOIS INC. *British Patent 1,345,549*  
PdO and related metal oxide resistors are very sensitive to firing schedules and their stability is low. These problems are now overcome by the use of metallising compositions which contain an organic Pd, Rh, Ir, Ru, or In compound.

### Electrically-insulating Seal between a Metal Body and a Semiconductor Device

R.C.A. CORP. *U.S. Patent 3,769,688*  
A seal is built up by oxidising the surface of the semiconductor, depositing a layer of Si, evaporating Pd on to the Si and finally covering the Pd with W, Ni and a solder.

### Printed Dielectric/Palladium-Silver Structures

E. I. DU PONT DE NEMOURS & CO.  
*U.S. Patent 3,770,496*  
In a method for printing multilayer electronic structures on a substrate which minimises degradation at crossovers, at least 20% Ag is incorporated in the metallisation used to print the Au electrode which is used with dielectric crossovers and a Ag or Ag/Pd electrode.

### Electrical Resistance Compositions

SHOEI CHEMICAL INDUSTRIES CO. LTD.  
*U.S. Patent 3,776,772*  
An electrical resistance composition comprises particles of RuO<sub>2</sub> coated with Nb and/or Nb oxide and a glass frit. In one example the composition contains RuO<sub>2</sub>/Nb particles (12 parts) with 63 parts glass frit and 25 parts alkyd resin solution.

### Electro-conductive Material and RuO<sub>2</sub>

MURATA MANUFACTURING CO. LTD.  
*U.S. Patent 3,778,389*  
An electro-conductive material, essentially consisting of a double oxide obtained from PbO and RuO<sub>2</sub> in a molar ratio of 3:1 to 1:3, is useful as the fundamental composition for production of a resistor paste, a ceramic resistor or the like.

### Tungsten Electrical Switching Contacts

ECHLIN MANUFACTURING CORP.  
*U.S. Patent 3,778,576*  
The contacts consist of a porous body, obtained by leaching Fe from a W, Mo, Re, or Nb alloy, plated with a thin layer of Au, Ag, Pt, Pd, or Rh and then with Ni or Co.

### Method of Platinum Diffusion in Semiconductors

T.R.W. INC. *U.S. Patent 3,783,049*  
A controlled degradation of minority carrier

lifetime in a Si semi-conductor crystal body uses H<sub>2</sub>Pt(OH)<sub>6</sub> as a source of Pt. One gram of H<sub>2</sub>Pt(OH)<sub>6</sub> is dissolved in 130 cm<sup>3</sup> anhydrous acetone and approximately 0.05 cm<sup>2</sup> of this solution is placed on the surface of a Si semiconductor crystal body. The solution is dried and the body is then heated to the Pt diffusion temperature for a time sufficient to have Pt atoms uniformly distributed throughout the active portion of the Si crystal.

### Process for Making Capacitors

E.I. DU PONT DE NEMOURS & CO.  
*U.S. Patent 3,784,887*  
An improved process for making multilayer monolithic capacitors uses metallised areas which can be cofired with reactive dielectric materials at elevated temperatures. The metallisation materials contain critical proportionate amounts of Pt and/or Au and Pd and optionally Ag.

### Resistance Pastes

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT  
*German Offen. 2,234,543*  
Pd, Ru and other noble metal sulphides are used as semiconducting constituents in resistance pastes. Noble metal or metal alloy powders may also be present. In an example PdS is used with B oxides, red Pb, SiO<sub>2</sub>, and ZnO to form a frit used in screen printing compositions.

### Resistance Pastes

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT  
*German Offen. 2,234,644*  
Pastes for the production of fired electrical resistances are based on the use, as conductor, of semiconducting mixed crystals of PdO and CuO, optionally accompanied by a noble metal powder, e.g. a Ag-Pd alloy powder.

## TEMPERATURE MEASUREMENT

### Thermistors

GENERAL ELECTRIC CO. *U.S. Patent 3,766,511*  
Thermistors are provided in which the thermally sensitive semiconducting material has the formula PbO.PdZO<sub>4</sub>, where Z is selected from Cr, Mo, W, and S. The thermistor device can be made by dipping two closely spaced electrical conductors into a melt of the thermally sensitive semiconducting material to form an element of the material between the conductors.

### Resistance Thermometer Element

JOHNSON, MATTHEY & CO. LTD.  
*U.S. Patent 3,781,749*  
A temperature-sensitive element is made from a layer of glass containing conducting particles attached to a non-conducting support. Au, Ag, Pt metals, Fe, Ni, Co, or Cu may form the particles.