

The Effect of Reactor Exposure on Thermocouple Materials

N. F. PRAVDYUK, A. N. IVANOV and K. P. DUBROVIN,
Atomnaya Energiya, 1968, **25**, (3), 233-235

Neutron irradiation causes slight changes in the thermo-e.m.f. of thermocouple materials due to the formation of radiation defects. Tests using up to $\approx 10^{20}$ neutron/cm² on 60% Au-Pd, Pt,

13% Rh-Pt, and base metal alloys showed that after annealing there is a slight increase in thermo-e.m.f. for 60% Au-Pd and a slight decrease for Pt and 13% Rh-Pt. Results are tabulated and displayed graphically. Annealing reduces the number of defects and hence errors in thermocouples exposed to radiation at high temperatures may be lower than those at lower temperatures.

NEW PATENTS

METALS AND ALLOYS

Alloy

INTERNATIONAL BUSINESS MACHINES CORP.
British Patent 1,125,690

Magnetic thin films for computer storage elements may be made from an alloy of 69.9-80 at.% Ni, 18-20.2 at.% Fe and 1-12 at.% Pd.

Finely Divided Noble Metal Alloys

E. I. DU PONT DE NEMOURS & CO.
U.S. Patent 3,390,981

Alloys of two noble metals selected from Ag, Au, Pt and Pd are produced by mixing solutions of salts of these metals and then reducing the mixture (e.g. of Pd and Ag nitrates) to give an alloy in finely divided form. H₃PO₂ is a suitable reducing agent.

A Niobium-Tungsten Alloy

BIRMINGHAM SMALL ARMS CO. LTD
U.S. Patent 3,395,012

An alloy consists of at least 30% Nb, 10-25% W, up to 40% Ta, and 0.1-10% of at least one element selected from Ru, Os and Ir.

Laminated Metal Plates and Strip

JOHNSON, MATTHEY & CO. LTD
German Patent 1,271,494

The bonding of Pt or Pt alloy to Ti, Ta, Nb, V or Zr mechanically, especially to produce electrodes, is improved by using pressures of 80-800 kp/cm² at 800-950°C.

Fountain Pen Ruthenium Alloy

W. C. HERAEUS G.M.B.H.
German Patent 1,276,332

A ternary alloy for nib tips comprises 10-40% Re, 15-45% Ru and 15-50% W.

CHEMICAL COMPOUNDS

Trimeric Ruthenium Carbonyl

LONZA LTD
U.S. Patent 3,387,932

[Ru(CO)₃]₃ is prepared by reacting a basic Ru salt and a carboxylic acid or Ru acetylacetonate

with CO at elevated temperature and pressure in the presence of MEK or a lower alcohol.

ELECTROCHEMISTRY

Porous Electrodes for Electrochemical Cells

GULF GENERAL ATOMIC INC.
British Patent 1,124,362

Metal porous electrodes are produced by shaping a mixture of metal particles, e.g. Ni, with C particles using heat and pressure and then removing the C by electrolysis. The porous Ni matrix is impregnated using a thermally unstable organic salt of a Pt metal.

Anodes for Electrolytic Cells

TSURUMI SODA CO. LTD
British Patent 1,128,136

Anodes for the electrolysis of halide compounds (e.g. NaCl) are produced from an alloy of 3-80% Pd and 97-20% Rh or of 5-80% Pd and 95-20% Pt which is subjected to oxidative treatment at 180-1350°C in an oxidising atmosphere, or electrolytic oxidation in a fused salt bath.

Electrocatalytic Surfaces

GENERAL ELECTRIC CO. (NEW YORK)
U.S. Patent 3,396,091

High electrocatalytic activity is produced by plating a Pt metal-base metal alloy from a common bath and then removing the base metal by etching.

ELECTRODEPOSITION AND SURFACE COATINGS

Metallising Compositions

E. I. DU PONT DE NEMOURS & CO.
U.S. Patent 3,385,799

Electroconducting areas are produced on non-conducting surfaces, especially ceramics, using a mixture of 30-90% noble metal alloy powder, dispersed in 10-70% of an inert liquid organic vehicle; the powder has 90% of the particles not greater than 5 microns in size and is made from two noble metals selected from Ag, Au, Pt and Pd.

Platinum Metal Chemical Plating

INTERNATIONAL NICKEL CO.

U.S. Patent 3,387,987

The chemical plating of metals, especially Ni and its alloys, is achieved by immersion of the metals in a bath containing, per litre, 1–10g of Pd, Pt, Rh or Ru, 64–96g HCl, 0.1–2.5g Cu and 0–5g Fe.

JOINING

Refractory Metal-to-Ceramic Seal

A. E. MILCH et al.

U.S. Patent 3,386,160

Ceramic surfaces are provided with a layer of spongy Mo and/or W and a wetting alloy, selected from Ta-Rh, Rh-Mo and Ru-Mo alloys, is melted on the spongy layer so that brazing to Ta and Nb alloys can take place.

Noble-metal-coated Ceramic for Seals

INFRARED INDUSTRIES INC.

U.S. Patent 3,390,969

A ceramic substrate is coated with (a) a metal oxide, (b) Cu, Ni, Cr, Mn, Ti, stainless steel or Ni/Cr and then with (c) Au, Ag, Pt, Rh or Ir. The laminate material is used for making glass-glass seals, especially in electronic components.

HETEROGENEOUS CATALYSIS

Process for Isomerising Terminal Olefines

ETHYL CORP.

British Patent 1,122,056

Internal olefines are produced from terminal olefines when contacted with one or more Group VIII metals, optionally together with an alcohol or aldehyde promoter. The preferred catalysts contain Ru with one or two other Group VIII metals.

Production of Hydroxylamine Sulphate

INVENTA A.G.

British Patent 1,122,103

HNO₃ is reduced with H₂ in aqueous H₂SO₄ in the presence of a Pt catalyst, e.g. Pt/C, to give hydroxylamine sulphate.

Improvements Relating to the Treatment of Oils

UNILEVER LTD.

British Patent 1,122,398

The linoleic acid of edible vegetable oils is hydrogenated selectively to linolenic acid at 150–250°C in the presence of a mixture of Cu and a more active metal, especially Pd or Pt.

Improvements in or Relating to the Production of Esters

DISTILLERS CO. LTD

British Patent 1,122,444

Better yields of vinyl acetate are obtained in the oxidation of C₂H₄ over a Pt group catalyst in the

presence of 5–15 wt% H₂O, acetate ions, CH₃COOH and halide ions.

Production of a Mixture of Stereoisomers of 4,4'-Methyldenedi-(cyclohexylamine)

E. I. DU PONT DE NEMOURS & CO.

British Patent 1,122,609

Essentially complete hydrogenation of p,p'-methylene-dianiline to give this mixture of isomers is achieved at high pressure and temperature in the presence of NH₃, inert organic solvent and a special Ru catalyst. The catalyst consists of (a) Ru supported on CaCO₃ and/or a rare earth oxide or (b) Ru supported on Al₂O₃, BaSO₄ or kieselguhr and moderated with 0.1–15% of a basic alkali metal compound.

Production of Carboxylic Acids or Esters

BADISCHE ANILIN- & SODA-FABRIK A.G.

British Patent 1,123,367

An unsaturated compound is reacted with CO and H₂O, an alcohol or a phenol at elevated temperature in the presence of Pd metal or a Pd chalcogenide with an acid and an organic phosphine and/or nitrile. Pd/SiO₂ and PdO are examples of the catalyst.

Catalytic Hydrogenation of Unsaturated Aldehydes

JOHNSON, MATTHEY & CO. LTD

British Patent 1,123,837

The catalyst for the selective hydrogenation of an unsaturated aldehyde to an unsaturated alcohol comprises Pt promoted with an alkaline hydroxide in an alcoholic solvent, e.g. Pd/C promoted with alcoholic KOH.

Dehydrogenative Coupling of Organic Compounds

BRITISH PETROLEUM CO. LTD

British Patent 1,123,874

Diphenyl is obtained from C₆H₆ by dehydrogenative coupling over Pt or Pd metal supported on a non-acidic inorganic support, e.g. SiO₂, quartz wool or Al₂O₃.

Improvements in and Relating to Catalysts

JOHNSON, MATTHEY & CO. LTD

British Patent 1,124,504

Catalysts of enhanced activity and comprising intimate homogeneous mixtures of the oxides of two or more Pt group metals (but excluding mixtures containing OsO₄ and mixtures of Pt and Rh oxides and Pt and Ru oxides) are prepared by the Adams method.

Preparation of Cyclohexanone

INVENTA A.G.

British Patent 1,125,199

Cyclohexanone is prepared by the hydrogenation of liquid C₆H₅OH as it trickles over a Pt group metal catalyst at up to 250°C in the presence of

H₂. The only catalyst specified in the examples is Pd/Al₂O₃.

Hydrogenation of C₄-Hydrocarbons containing Butadiene and *n*-But-1-ene

FARBENFABRIKEN BAYER A.G.

British Patent 1,126,848

Hydrogenation of butadiene mainly to the *n*-butene-2 isomer takes place in a descending stream over a fixed catalyst, especially Pd/Al₂O₃ or zeolite chips.

Preparing *cis*-Cyclodecene

UNIVERSAL OIL PRODUCTS CO.

British Patent 1,127,702

The selective hydrogenation of *trans, cis* - 1,5 - cyclodecadiene to this compound at 0.100°C and 13.6-68 atm is catalysed by Pt/Al₂O₃.

Preparation of Urethanes

AMERICAN CYANAMID CO.

British Patent 1,127,988

A route avoiding the use of isocyanates in the production of urethanes consists of reacting an organic N compound, an organic hydroxyl compound and CO in the presence of a Lewis acid - noble metal catalyst. "Noble metal" is defined as one of the six Pt metals and the catalyst can be in the form of the metal or a salt of it. A typical catalyst consists of Pd/C and FeCl₃.

Production of Vinyl Acetate

B.P. CHEMICALS (U.K.) LTD

British Patent 1,128,993

A new catalyst for C₂H₄ oxidation in the presence of CH₃COOH is a Pt group metal deposited on TiO₂, an alkali, alkaline earth, Zn, Co, Ni, or Fe silicate and/or their mixtures. A typical catalyst is PdCl₂ on TiO₂.

Manufacture of β-Pinene

FARBWERKE HOECHST A.G.

British Patent 1,129,622

The isomerisation of α-pinene to β-pinene is catalysed by a Pd/C catalyst in the presence of H₂ at 140-200°C.

Production of Organic Esters

FARBENFABRIKEN BAYER A.G.

British Patent 1,129,668

Anolefine with 3 or more C atoms or an alkyl benzene is reacted with O₂ and an organic acid having a higher molecular weight than CH₃COOH in the presence of Pd metal catalyst at elevated temperature. In 1,129,669 the Pd metal catalyst is accompanied by the alkali or alkaline earth metal salt of an organic acid.

Preparation of Hydroformylation Products

DEUTSCHE GOLD-UND SILBER-SCHNEIDANSTALT

British Patent 1,129,809

Tetrahydrophthalic acid anhydride or esters are

hydroformylated with H₂/CO in the presence of a Rh, Ir or Ru catalyst or a compound of these metals forming a carbonyl in the reaction conditions. A typical catalyst is Rh₂O₃.

Dehydrogenation Process

MONSANTO CO.

British Patent 1,131,983

Saturated hydrocarbons are dehydrogenated to olefines over a catalyst. The catalyst is prepared by impregnating Al₂O₃ with 0.02-5 wt% of a noble metal compound and then reducing the compound to the metal. Pt is the preferred metal.

Catalyst Compositions

MONSANTO CO.

British Patent 1,131,984

A dehydrogenation catalyst is produced from an Al₂O₃ support having a macropore volume of at least 0.05 cc/g with an alkali or alkaline earth compounds and noble metal compound to deposit at least 0.01 wt% alkali or alkaline earth metal and 0.02-5 wt% noble metal (especially Pd or Pt).

Catalytic Hydrocracking

MOBIL OIL CORP.

U.S. Patent 3,384,572

A high aromatic feedstock is cracked over a catalyst consisting of a hydrogenation component having an activity of 5-35 on a crystalline aluminosilicate, e.g. Pt on a rare earth aluminosilicate.

Hydrocracking Catalyst

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,385,781

Selective hydrocracking, especially of a pre-cracked feed, is carried out over a Pt catalyst supported on an aluminosilicate zeolite having pore openings of a 6-15Å and containing less than 10 wt% alkali metal oxide.

Hydrocarbon Hydrocracking

CHEVRON RESEARCH CO.

U.S. Patent 3,385,782

Light 1-4C hydrocarbon gases are produced from heavy hydrocarbons by hydrocracking over a Group VIII metal catalyst on a crystalline aluminosilicate zeolite. A typical Group VIII metal is Pd.

Alkyl Mononitrile Production

COMMERCIAL SOLVENTS CORP.

U.S. Patent 3,385,880

Mononitriles are produced by the vapour phase reduction of nitroalkanes over Pt catalysts, e.g. Pt/Al₂O₃.

Two-stage Steam Reforming

CATALYSTS AND CHEMICALS INC.

U.S. Patent 3,388,074

A steam-gas hydrocarbon reforming catalyst

promoted with Pt or Pd supplies heat to the system while giving combustion and reforming in the first stage.

Combustion Catalyst

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,388,077

A catalyst for oxidising noxious gases consists of an Al_2O_3 porous carrier containing a Ca, Sr or Ba oxide uniformly distributed throughout it; 1–20 wt% of Pt is present as an embedded layer below the surface of the carrier.

Hydroisomerisation Process

TEXACO INC.

U.S. Patent 3,389,191

The hydroisomerisation of $n\text{-C}_4\text{H}_{10}$ with a chloride-activated Pt/ Al_2O_3 is improved when the catalyst is spent, by treating it with H_2 under "non-flowing" conditions at 450–700°F.

Hydroxylamine Production

STAMICARBON N.V.

U.S. Patent 3,390,954

Hydroxylamine is produced by the hydrogenation of an alkyl nitrite in an acidic medium over a noble metal catalyst, especially Pd/C.

Preparation of Cyclic Olefins

STAMICARBON N.V.

U.S. Patent 3,391,206

These compounds, especially cyclohexene, are produced from aromatic compounds by hydrogenation in the presence of a lower alkanol solvent in the presence of a Ru catalyst, e.g. Ru black.

Catalytic Dehydrogenation of Paraffins

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,391,218

A 3–20 C paraffin is dehydrogenated in the presence of hydrogen and an aromatic hydrocarbon over a Group VIII noble metal catalyst, especially an As-attenuated supported Pt catalyst.

Hydroisomerisation of Paraffins

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,391,220

A 4–5 C paraffin is isomerised in the presence of a Pt metal-halogen supported catalyst, a halide promoter and a small amount of C_6H_{14} .

Noble Metal-Alumina Catalysts

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 3,397,154

Catalysts for ICE combustion consist of (a) oxides and mixed oxides of Fe, Co, Ni, V, Cr, Mn, Cu, Zn, Mo, Ag, Sn, Ba, Ce, W, Pb, or Bi, (b) Ru, Pt, Pd, Rh, Os or Ir metal and (c) an Al_2O_3 support having a crystalline cellular structure with walls of 0.3–200 mils thickness.

trans-1,4-Diene Production

B. F. GOODRICH CO.

U.S. Patent 3,398,209

These dienes may be obtained by the reaction of a 4–6 C 1,3-diene and C_2H_4 in the presence of reduced Pd obtained from a Pd compound and an alkyl Al halide.

Platinum Catalyst

STE FRANCAIS DES PRODUITS POUR CATALYSE

French Patent 1,517,713

Products of high octane number are obtained by reforming over a Pt/Cl/ Al_2O_3 catalyst obtained in a specified way. Al_2O_3 is treated with aqueous HCl representing 0.5–5% Cl_2 , based on the Al_2O_3 and dried at 540–600°C until its IR spectra shows the absence of OH absorption bands. Pt is then incorporated in the usual way.

Crotonaldehyde Hydrogenation

JOHNSON, MATTHEY & CO. LTD

French Patent 1,519,568

Butyraldehyde is produced by the hydrogenation of crotonaldehyde in a trickle column over a supported Pd catalyst, e.g. Pd/ Al_2O_3 .

Suspended Platinum Hydrogenation Catalyst

DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT

German Patent 1,272,292

Suspended, unsupported Pt metal catalysts in a liquid organic medium are recovered from the liquid by means of a carbon filter with a maximum pore width of 15 μ . The catalyst particles have a diameter of 0.01–1 μ .

Production of Epoxy Organic Hydrogen Polysiloxanes

FARBENFABRIKEN BAYER A.G.

German Patent 1,272,550

Sil-group addition to an olefinic epoxide is catalysed by finely divided Pt or Pd, optionally in the presence of an inert solvent.

Tetrachlorophthalodinitrile Production

BADISCHE ANILIN- & SODA-FABRIK A.G.

German Patent 1,277,838

The reaction of phthalodinitrile with Cl_2 is catalysed by SiO_2 carrying 0.5–5 wt% Pd and/or Pt as well as 0.5–10 wt% of an alkali and/or alkaline earth phosphate and/or borate.

HOMOGENEOUS CATALYSIS

New Organic Rhodium Complexes

IMPERIAL CHEMICAL INDUSTRIES LTD

British Patent 1,121,642

New Rh catalysts, especially for chemical reactions, are new complexes of formula $\text{Rh}(\text{X})(\text{YRR}'\text{R}'')_3$, where Y is P, As or Sb, X is an anionic element or group, especially Cl or NCS, and R, R' and R'' are hydrocarbon groups.

Preparation of Oxygen-containing Organic Compounds

LUMMUS CO.

British Patent 1,122,040

Acetals, ketals, cyclic ethers, aldehydes, ketones, etc., are produced by reacting unsaturated compounds with alcohols in the presence of Group VIII noble metal catalysts, especially in 0.001–0.1 M proportions. Usually PdCl₂ is used with CuCl₂.

Hydrogenolysis Process

HALCON INTERNATIONAL INC.

British Patent 1,122,702

Hydrogenolysis of an alpha-alkyl alcohol to remove the OH group is catalysed at 50–120°C in the liquid phase by a Pt group metal catalyst, e.g. PdCl₂.

Production of Unsaturated Lactones Having a Five-membered Ring

BADISCHE ANILIN- & SODA-FABRIK A.G.

British Patent 1,123,018

Lactones with side chains are obtained from an olefin, CO and (a) a Pd catalyst in an amount of 0.01–20% of the olefin and 20–150%, based on the Pd, of a hydrogen halide or (b) 0.01–20% of a Pd halide, based on the olefin. PdI₂ is a suitable catalyst.

Decomposition of Formic Acid

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 1,126,022

HCOOH in admixture with another carboxylic acid is destroyed by contacting the mixture with a Pt group metal in the presence of a base. Ir, e.g. as H₂PtCl₆, is a suitable metal.

Catalysts

DOW CORNING CORP.

British Patent 1,127,675

A new catalyst for the SiH addition reaction is a reaction product of H₂PtCl₆ and at least one siloxane. These catalysts are more compatible with the reactants and less Pt is used.

Chemical Process

AEROJET-GENERAL CORP.

British Patent 1,128,103

N₂F₄ is produced by the oxidation of N₂N-difluorocarbamate in the presence of an alkali metal complex salt and a higher metal halide, including Pt (IV), Ru (VIII) and Ir (VI) halides. For example, RuCl₈ may be used with KMnO₄.

Manufacture of Urethanes

IMPERIAL CHEMICAL INDUSTRIES LTD

British Patent 1,129,551

The production of urethanes by reacting hydroxylic compounds, CO and N compounds, such as

azoxy compounds, is catalysed by transition metal complexes, especially phosphine complexes of Ir, Rh, Pt and Pd.

Preparation of Glyoxal

IMPERIAL CHEMICAL INDUSTRIES LTD

British Patent 1,130,760

C₂H₄ is oxidised to glyoxal by HNO₃ in aqueous medium in the presence of a catalytic mixture of a Li salt and Pd metal or a Pd compound, e.g. PdCl₂ and Li₂CO₃.

Polymerisation Process

UNIROYAL INC.

British Patent 1,131,160

The polymerisation of cyclic olefines is catalysed by an Ir trihalide, especially a complex of the trihalide with an olefine, e.g. Ir monochloride cyclooctene.

Platinum Catalyst for SiH-Olefin Addition Reactions

GENERAL ELECTRIC CO. (NEW YORK)

U.S. Patent 3,385,876

A catalyst soluble in organic solvents is produced by reacting H₂PtCl₆ with Ti alkoxy, e.g. Ti(OBu)₄.

Catalyst for Cyclooctadiene Isomerisation

PHILLIPS PETROLEUM CO.

U.S. Patent 3,387,045

An unconjugated cyclooctadiene is isomerised to a conjugated diene over a complex catalyst formed from a nitrile and a Pt or Pd chloride or bromide, e.g. bis(benzonitrile)palladium dichloride.

Oxalic Ester Production

UNION OIL CO. OF CALIFORNIA

U.S. Patent 3,393,136

Oxalates are obtained when CO is reacted with a substantially anhydrous alcoholic medium containing 0.001–2 wt% of a Pt metal (e.g. PdCl₂) and 0.05–5 wt% of a soluble cupric or ferric redox salt.

Allyl Complexes of Palladium

MONSANTO CO.

U.S. Patent 3,397,214

Pd catalysts and additives are obtained by reacting bis-aryl cyanide-Pd(II) dihalides with tetraalkyl-allenes to give tetraalkyl-allyl palladium dihalides.

Diene Production

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 3,397,252

Dienes are produced from monoethylenically unsaturated compounds having a terminal halogen atom by their reaction with a stannous salt in the presence of a Pt group metal, e.g. IrCl₃, Na₃IrCl₆, PdCl₂ or (Et₄N)₄Sn₈Pt₃Cl₂₀.

Unsaturated Gamma-Lactone Production

BADISCHE ANILIN- & SODA-FABRIK A.G.

German Patent 1,276,029

These lactones may be produced from olefines and CO at elevated temperatures and pressures in the presence of PdCl₂/PdBBr₂/PdI₂, optionally in the presence of excess halogen acid or Pd.

Production of Isopropenyl Carboxylic Esters

CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE

German Patent 1,277,246

The transesterification of isopropenyl acetate or propionate with another carboxylic acid is catalysed with 0.001-0.1 mol/mol acid of a Pd salt, e.g. a salt of one of the acids concerned or a double chloride.

FUEL CELLS

Method of Preparing Fuel Cell Catalysts

AMERICAN CYANAMID CO.

British Patent 1,123,957

Catalytic electrodes of enhanced activity are produced by reducing a noble metal compound, in the presence of an electroconductive filler, using a di- or tri-substituted silane containing a SiH group, dissolved in alcohol, so that the deposited noble metal has a crystallite size of 20-35Å. In an example graphite is suspended in C₂H₅OH and a mixture of H₂PtCl₆ and RhCl₃ dissolved in the alcohol. Diphenyl silane is added to reduce the salts to Pt and Rh.

Electrochemical Combustion of Methanol

ROBERT BOSCH G.m.b.H.

British Patent 1,130,733

The fuel cell catalyst is a Raney alloy of Ru which one or more Group VIII Pt metals and/or Au, e.g. a 4:3:3 alloy of Ru, Ir and Au.

Hydrogen Diffusion Anode for a Fuel Cell

LEESONA CORP.

U.S. Patent 3,393,098

A sandwich anode of three layers is used which comprises (in contact with the electrolyte) a non-porous H₂ diffusion membrane, a Group VIII metal black layer and a catalyst layer (in contact with the fuel). One combination that is proposed is Pd-Ag alloy/Pd black/Zn-Cu-Cr.

Porous Electrode Production

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,395,049

A mixture is formed from a finely divided halogenated hydrocarbon polymer, an active catalyst (including Group VIII metals and alloys) and a decomposable particulate filler. The mixture is shaped, the shaped product is heated to decompose the filler and further catalytic metal is deposited in the pores of the product. A catalyst may be Pt-Ir or Pt-Re deposited on C.

ELECTRICAL AND ELECTRONIC ENGINEERING

Cermet Resistance Element

BECKMAN INSTRUMENTS INC.

U.S. Patent 3,386,165

Noble metal conductors are attached to cermet resistors by applying a mixture of glass frit and noble metal particles to both items and firing them in contact. "Noble metal" is especially Ag, Pd, Pt, Rh and their alloys.

Metallic Coatings on Printed Circuit Boards

MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD

U.S. Patent 3,391,455

A board base is dipped in a synthetic resin adhesive and then coated, by scattering, with a metal powder containing Cu, Fe, Co, Al, Ni, Au, Ag, Be, Pt, Pd, Rh or their alloys. The board is stoved after the powder has been pressed into the surface of the adhesive. The projecting particles of powder form a base for subsequent chemical (electroless) plating.

Production of a Tantalum Electrolytic Capacitor

SIEMENS A.G.

German Patent 1,275,207

A cathode for this type of capacitor is produced by applying a surface layer of Pt by means of a paint, burning off the organic portion and then firing the Pt.

TEMPERATURE MEASUREMENT

Electrical Resistance Thermometers

ROSEMOUNT ENGINEERING CO. LTD

British Patent 1,127,946

A strip of metal is formed into a roll with the adjacent layers insulated from one another, it is sliced in parallel planes normal to the axis of the roll to give spiral elements and these are attached to a ceramic disc. Pt foil may especially be treated in this way.

Noble Metal Thermometer Wires

DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT

German Patent 1,274,344

Noble metal, especially Pd wires are produced by making very fine powders by reduction at temperatures below 500°C, preferably below 350°C, to give a particle smaller than 0.06 mm. The powders are boiled in acidified water, dried at low temperature, compressed, sintered at 1300-1500°F for 2-8 hours and cold shaped to wire without an intermediate anneal. The wire is stress-relieving annealed at 1300-1500°C for 5-20 minutes.