

### Thickness Dependence of an Amorphous Overlayer Ge Film on the Electrical Conductivity of Ultrathin Pt Films

S. OGAWA, *J. Vacuum Sci. Technol.*, 1978, **15**, (2), 363-365

The effect of amorphous Ge thin overlayers on the resistance of ultra-thin Pt films was studied. The ratio of the resistance changes in the films is  $10^{-2}:1:10^2$  for continuous, semicontinuous and discontinuous Pt films. The resistance changes for semicontinuous and discontinuous Pt films depends on the Ge thickness. With increasing overlay thickness the resistance for semicontinuous films increases at first, while for discontinuous ones it rapidly decreases, then decreases for both films to a saturation value.

### Some Aspects of Multilayer Ceramic Chip Capacitors for Hybrid Circuits

W. NOORLANDER, *Electrocomponent Sci. Technol.*, 1978, **5**, (1), 33-40

The dimensions, electrical properties, inner electrodes and end terminations of multilayer ceramic chip capacitors were studied. For inner electrodes Pd is attractive for non-Bi containing ceramics since Pd has excellent conductivity. For end terminations resistance to leaching was improved as Pd content increased, the Pd preventing Ag migration. For storage purposes the more Pd that is added to the end terminals the greater the resistance against sulphurisation.

## TEMPERATURE MEASUREMENT

### Temperature Detection Using Platinum Film

G. E. WOLFE, *Electron. Engng.*, 1978, **50**, (604), 87-88

The Pt film temperature detector uses thick or thin film techniques to deposit a layer of Pt on a ceramic substrate, which is then fired and trimmed to close electrical tolerances by automatic or semi-automatic means, such as laser cutting of the resistance track. These films conform to B.S. 1904 Grade II tolerance, i.e. at 0°C

the resistance will be  $100\Omega \pm 0.1\Omega$ . The response to temperature is almost linear. The maximum error from 0-100°C is 0.4%, but from 0-200°C it may rise to 0.8%, and the devices are entirely predictable. The uses include temperature compensation of electronic circuits and cold junction compensation of thermocouple amplifier circuits.

### Glass Enclosed Resistance Thermometer for Temperature Measurement inside a High-Pressure Vessel

N. J. TRAPPENIERS, S. N. BISWAS and P. VAN'T KLOOSTER, *Rev. Sci. Instrum.*, 1978, **49**, (7), 1007-1008

A Pt resistance thermometer, enclosed in glass to protect it from changes of hydrostatic pressure which would affect its resistance, is used to measure temperatures in a high-pressure vessel. Very fine wire of 0.1 mm diameter is used for the contacts to prevent the differences in compressibilities from cracking the glass at high pressures. Comparisons with an ordinary calibrated resistance thermometer at pressures up to 2500 bars showed the difference in measured temperature to be less than 0.005°C.

## MEDICAL USES

### Stiffening up Cell Membranes Could Stop Tumour Growth

*New Scientist*, 1978, **79**, (1111), 108

A process, similar to that for hydrogenating vegetable oils, which hardens the outer walls of cells to prevent them dividing is described. It involves a homogeneous reaction with Rh contained in a soluble complex. The Rh breaks the double bonds in the lipid molecules in the cell, thus forming a more rigid structure which will not divide. Tests on living cells have been successful and may provide remission for cancer patients, enabling them to undergo treatment by other techniques. This process is more specific for hydrogenating particular bonds than heterogeneous catalysis.

## NEW PATENTS

### ELECTROCHEMISTRY

#### Electrodes

SUMITOMO CHEMICAL CO. LTD.

*British Patent* 1,508,876

Electrodes for use in the production of Al by molten-salt electrolysis of Al oxide are coated with a binary metal oxide, in which preferably at least one of the metals is a Pt group or lanthanide metal. Examples are PtCoO<sub>2</sub>, PtRhO<sub>2</sub>, PdCoO<sub>2</sub>, PdRhO<sub>2</sub>, PdNiO<sub>2</sub>, AgInO<sub>2</sub>, or AgRhO<sub>2</sub>.

### Platinum Anodes for Electrolysis Apparatus

NORDA MINES LTD.

*U.S. Patent* 4,085,016

An electrolysis apparatus which is used to oxidise organic material present in concentrated sulphuric acid uses as its anode a valve metal substrate (Ti, Ta or Nb) painted with a coating of Pt and/or Ir which is then fired and electroplated with a Na hexahydroplatinate bath. This electrode is far more corrosion resistant than Ti clad with Pt, pure Pt wire or a conventional electroplated Pt anode.

### Anode for Electrolysis

SIGRI ELEKTROGRAPHIT G.m.b.H.

*German Offen. 2,645,414*

An anode for the electrolytic production of  $MnO_2$  is of Ti plated with Au or a Pt group metal, preferably Pt or Ru, and activated by heating at 700–1100°C.

## ELECTRODEPOSITION AND SURFACE COATINGS

### Conductive Coatings

HERCULES INC.

*British Patent 1,512,309*

Coatings of good strength and adhesion are obtained from compositions containing 2–40% of a crystallisable glass frit binder together with a liquid vehicle and 50–88% of finely divided Pt group metal, Au or Ag.

### Salt Bath Electroplating

F. VON STUTTERHEIM

*British Patent 1,515,738*

Metal wire, strip, chain, gauze, etc., is electroplated with Au, Ag or Pt group metals in a thickness in the micron range by the use of a noble metal salt dispersed in a Group IA and/or IIA cyanide, thiocyanate and/or cyanamide molten salt electrolyte. In one example Mo foil is plated with 3 microns of Pt using 3.5% Pt dissolved in a 2:1 mixture of K cyanide and K thiocyanate at 450°C.

### Platinum-Rhodium Alloy

CHROMALLOY AMERICAN CORP.

*U.S. Patent 4,070,507*

Aluminised Ni, Co or Ni-Co based heat resistant alloy substrates are coated, prior to aluminisation, with a thin layer of Rh and then a thin layer of Pt.

### Electrodeposition of Ruthenium

G.T.E. AUTOMATIC ELECTRIC LABORATORIES INC.

*U.S. Patent 4,082,622*

The process, which provides a relatively thick layer of Ru, consists of pulse current plating a layer of Au on the surface of the metal article to be treated and then electroplating Ru on the Au.

## LABORATORY APPARATUS AND TECHNIQUE

### Gas Monitor

BRITISH STEEL CORP.

*British Patent 1,512,002*

A device for measuring  $SO_2$  in air is a glass absorption and titration cell having a Ag anode and a Pt wire cathode.

### Gas Laser

FERRANTI LTD.

*British Patent 1,516,808*

A gas laser has an anode, preferably of Pt, and a cathode which is a solid pellet of compressed powder containing at least 75% of Pt black, and is designed to reduce sputtering.

### Platinum-Iridium Alloy Wires for Gas Detector

MAX-PLANCK GES. ZUR FOERDERUNG DER WISSENSCHAFTEN e.V.

*U.S. Patent 4,081,345*

In an apparatus for determining small amounts of  $N_2$ , a plug is pierced by 4 wires of 90 Pt–10 Ir alloy which serve as electrodes.

## HETEROGENEOUS CATALYSIS

### Noble Metal Catalyst for Use in Upgrading Hydrocarbon Products

STANDARD OIL CO.

*British Patent 1,515,871*

A S-resistant catalyst for use, for example, in the production of upgraded hydrocarbon products from coal or tar consists of either one or more basic carbonates, hydroxides, oxides, or oxide-forming salts of a transition metal of Groups IVB, VB, VIB or VIIB; or a supported Ru, Rh, Ir, Os, Pd, Ni, Co and/or Pt catalyst.

### Palladium or Platinum Catalyst for Combustible Gas Detectors

ENGLISH ELECTRIC VALVE CO. LTD.

*British Patent 1,516,039*

The detector has a heatable wire filament of Pt embedded in a pellet which consists of a homogeneous mixture of  $Al_2O_3$ , Pt and Pd surrounded by a layer of an oxidising catalyst, Pt or Pd.

### Effluent Gas Purification

BAYER A.G.

*British Patent 1,517,258*

Organic compounds present in chemical-process off-gases which also contain boric acid are completely oxidised by reaction with  $O_2$  in the presence of a supported Pt group metal, preferably Pd or Pt catalyst.

### Recovery of Pt/Rh from Car Exhaust Catalysts

JOHNSON MATTHEY & CO. LTD.

*British Patent 1,517,270*

Precious metals, such as Pt and Rh, are recovered from exhaust catalysts by leaching with hydrochloric acid and a halogen or Na chlorate or bromate. The catalysts may optionally be subjected to a pre-treatment step to physically concentrate the majority of the precious metal in a small bulk.

### Platinum Catalyst for Hydrocarbon Treatment

ATLANTIC RICHFIELD CO.

*U.S. Patent 4,070,306*

The catalyst is prepared by (i) contacting a solid Pt group metal/ $Al_2O_3$  catalyst with a hydrocarbon and  $H_2$  to form C deposits on the catalyst, (ii) contacting the catalyst with an  $O_2$ -containing gas to remove the deposits, then repeating (i) and (ii) until the surface area of the catalyst is reduced to 20–90% of that in (i) and finally treating the catalyst with a Re component.

### Cracking Catalyst Additive Containing Platinum Group Metals

MOBIL OIL CORP. U.S. Patent 4,072,600

A catalytic process for cracking gas oil uses a solid acidic cracking catalyst to which is added 0.01–50 ppm of one or more of Pt, Pd, Ir, Os, Rh, Ru and Re.

### Platinum Group Metal Catalyst for Reducing Nitrogen Oxides

CORNING GLASS WORKS U.S. Patent 4,076,792

The catalyst, for the reduction of  $\text{NO}_x$ , especially those found in I.C.E. exhaust gases, consists of a monolithic refractory support on which is coated a composition which consists of 10–70% Ir and the remainder chosen from Pt and/or Pd.

### Noble Metal Catalyst for Coal Hydroconversion Catalyst

EXXON RESEARCH & ENGINEERING CO.

U.S. Patent 4,077,867

In a process for catalytically hydroconverting coal to give coal liquids, a mixture of an oil soluble metal compound, a  $\text{H}_2$  donor solvent and coal is formed, the metal compound converted to a catalyst within the mixture, and the mixture reacted with  $\text{H}_2$ . The metal used can be Pt, Pd, Rh, Ir, Os or Ru.

### Methanation Process

PHILLIPS PETROLEUM CO. U.S. Patent 4,079,072

Methane is prepared by reacting CO and  $\text{H}_2$  in the presence of a supported Rh-containing catalyst promoted with U. The activity of these catalysts, when poisoned with S, can be restored by contact with a S-free feed or CO and  $\text{H}_2$  at 350°C for a suitable time.

### Platinum and Indium-Containing Catalyst

AGENCY OF INDUSTRIAL SCIENCE & TECHNOLOGY

U.S. Patent 4,080,390

o-Phenylphenol is prepared by reacting o-cyclohexylphenol or its dehydrodimerised condensate and  $\text{H}_2$  in the presence of a catalyst consisting of an  $\text{Al}_2\text{O}_3$  or  $\text{SiO}_2/\text{Al}_2\text{O}_3$  support, up to 0.1% Fe, 0.1–50% Pt, Ir in an amount 0.1–0.4 times that of the Pt and 0.5–8.0% Group IA oxide.

### Platinum-Containing Fuel Cell Catalyst

SHELL OIL CO. U.S. Patent 4,081,409

A catalyst for fuel cell electrodes, with improved activity, consists of a Group VIII transition metal, specifically Pt, and a cocatalyst chosen from Sn, Pb, As, Bi, Re, Tl, Ta or Ti.

### Multimetal Hydrocarbon Conversion Catalyst

U.O.P. INC.

U.S. Patent 4,082,651

The catalyst, for use in hydrocarbon conversion reactions, consists of a porous carrier, 0.01–2.0% Pt or Pd, 0.01–2.0% Rh, 0.01–2.0% Re, 0.1–3.5% halogen and 0.01–1.0% S.

### Platinum Group Metal Isomerisation Catalyst

U.O.P. INC.

U.S. Patent 4,085,067

The catalyst, for hydrocarbon isomerisation reactions, consists of a halided porous carrier, 0.01–2.0% Pt group metal, 0.1–5.0% Co, 0.01–5.0% Sn, 0.1–10% halogen and 1–100% Friedel-Crafts metal halide.

### Platinum Group Metal-Base Metal Car Catalysts ( $\text{O}_2$ Storage)

JOHNSON MATTHEY & CO. LTD.

French Appl. 2,343,505

The catalyst, for the purification of exhaust gases, consists of one or more of Pt, Pd, Rh, Ir, Os, Ru, Au and Ag and one or more base metals, at least one of which has two or more oxidation states. The catalyst is capable of removing  $\text{O}_2$  from an  $\text{O}_2$ -rich gas stream.

### Palladium or Osmium Molybdate Catalysts

E. F. ETIENNE DE BERWINNE ET AL

French Appl. 2,345,163

A catalytic device for removing odours and polluting gases from the atmosphere can use Os or Pd molybdate as the catalyst.

### Supported Palladium Catalyst

JOHNSON MATTHEY & CO. LTD.

French Appl. 2,351,703

The catalyst is prepared by depositing a Pd compound in vapour form on to a suitable granular, porous, solid support which is kept at a temperature above the decomposition temperature of Pd.

### Rhodium or Iridium Catalyst for Ethane Production

ENTREPRISE DE RECHERCHES ET D'ACTIVITES PETROLIERES AND STE. NATIONAL ELF AQUITANE

French Appl. 2,346,309

Ethane is prepared by the selective hydrogenolysis of alkanes in the presence of a catalyst consisting of Rh or Ir dispersed on a support which is free of sulphate ions.

### Platinum Group Metal Catalyst for Hydrocarbon Treatment

CIE. FRANCAISE DE RAFFINAGE

French Appl. 2,347,096

The catalyst consists of an  $\text{Al}_2\text{O}_3$  support, a halide, 0.02–2.0% of a Pt group metal, specifically Pt, 0.02–2.0% Sn and 0.1–2.0% Si.

### Lanthanum and Ruthenium Oxide Catalyst

COMMISSARIAT A L'ENERGIE ATOMIQUE

French Appl. 2,354,813

The catalyst, for treating I.C.E. exhaust gases, consists of an inert support coated with La oxide and a catalytic phase which consists of a mixed oxide of Ru, La, Pt and Rh.

## Rh/SiO<sub>2</sub> for NO<sub>x</sub> Removal

JOHNSON MATTHEY & CO. LTD.

*South African Appl. 77,1544*

A process for the removal of NO<sub>x</sub> and for the oxidation of CO and hydrocarbons uses as a catalyst one or more of the Pt group metals, Au and Ag supported on SiO<sub>2</sub> or Al<sub>2</sub>O<sub>3</sub>.

## HOMOGENEOUS CATALYSIS

### Hydrogen Peroxide

AIR PRODUCTS AND CHEMICALS INC.

*British Patent 1,516,418*

The synthesis of H<sub>2</sub>O<sub>2</sub> from H<sub>2</sub> and O<sub>2</sub> in aqueous organic media is catalysed by complexes L<sub>2</sub>MX<sub>2</sub>, where L is preferably a tertiary phosphine or arsine and M is a Group VIII metal such as Pt, Ni, or, preferably, Pd.

### Hydroformylation Catalysts

CALIFORNIA INSTITUTE OF TECHNOLOGY

*British Patent 1,517,662*

Catalysts of good activity and stability are obtained by u.v. irradiation of a solution containing a transition metal compound and an amino polymer. The polymer may be a vinylpyridine polymer, and the metal is Pt, Pd, Ir, Rh or Ru.

### Rhodium Hydroformylation Catalyst

MONSANTO CO.

*U.S. Patent 4,072,709*

Lactic acid is prepared by the hydroformylation of a vinyl ester using a Rh complex catalyst, such as a cyclooctadiene-phosphine complex, to give a propionaldehyde which is then oxidised over a Ag catalyst and finally hydrolysed.

### Rhodium Polymer Catalyst for Alcohol Production

MOBIL OIL CORP.

*U.S. Patent 4,072,720*

Alcohols are produced by reacting aldehydes or acetals with H<sub>2</sub> in the presence of CO and a Group VIII catalyst, specifically Rh, in the form of a complex with a polymer carrying amine, thiol, phosphine or arsine groups.

### Palladium Cyanide Polymerisation Catalyst

UNION OIL CO. OF CALIFORNIA

*U.S. Patent 4,076,911*

Thermoplastic, soluble C<sub>2</sub>H<sub>4</sub>/CO copolymers are produced using a Pd(CN)<sub>2</sub> catalyst in the presence of an alkanolic acid substituted by a halide group on an  $\alpha$ -carbon.

## CHEMICAL TECHNOLOGY

### Platinum-Containing Brazing Material

GENERAL ELECTRIC CO.

*U.S. Patent 4,073,426*

W anode targets are joined to graphite substrates by a brazing method which employs a controlled atmosphere and Pt, or a Pt-Cr alloy, as the brazing material.

### Palladium Membranes for Hydrogen Generator

NIPPON SOKEN INC.

*U.S. Patent 4,078,985*

A H<sub>2</sub> generator for producing H<sub>2</sub> gas by electrolysing an electrolytic solution uses Pd or Pd alloy membranes as the cathode.

### Platinum Group Metal Isolation Layer for Diamond Manufacture

GENERAL ELECTRIC CO.

*U.S. Patent 4,082,185*

Diamond crystals of controlled impurity content and/or impurity distribution are prepared by a process which uses a layer of isolating material, such as Pt, Ir, Os, Rh, Pd and/or Ru, in combination with a layer of diamond nucleation suppressing material.

### Screen Printing on to Glass Bottles

STE. BORDELAISE DE DECORATION S.A.R.L.

*French Appl. 2,354,980*

After applying a suitable decoration to the bottle by screen printing, a spray gun is used to apply a layer of liquid, containing in suspension precious metal particles, so as to give a metallic appearance to the decoration after the solvent used has evaporated. The metals specified are Pt, Au and Ag.

## GLASS TECHNOLOGY

### Crucible for Melting Glass

OWENS-CORNING FIBERGLAS CORP.

*British Patent 1,508,820*

An apparatus for melting glass to produce filaments is lined with Pt or an alloy with Rh.

### Glass Making

SAINT GOBAIN INDUSTRIES

*British Patent 1,514,317*

A very rapid procedure for the manufacture and refining of glass is described. Pre-fused vitreous material is poured from a furnace into a horizontal channel where it is heated and mixed with a foaming agent to increase its volume by at least 50% and is maintained at a viscosity  $>1000$  poise until the foam collapses. The channel, heating elements, and accessories are constructed of a Pt-Rh alloy.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### Ceramic Sheets

G. J. ELDERBAUM

*British Patent 1,510,822*

The dimensions of ceramic thin sheets for uses such as bases for capacitors or printed circuits are controlled by defining a substantial border of metallic composition to the surface of the cast slip. A suitable metallic composition contains 40-60% Pt, 30-50% Pd and 5-15% Au in liquid.

### Electric Contacts

WESTERN ELECTRIC CO. INC.

*British Patent 1,514,795*

Ohmic conductors are formed on n-type semiconductors (especially GaAs) by deposition of a layer of Ge-Pd alloy and heating at 200–700°C for 5min–24h (preferably 300–550°C for 10min–3h).

### Semiconductor Device

POST OFFICE

*British Patent 1,517,537*

A GaAs laser includes layers of Au, Au-on-Pt-on-Ti, and Au-Ge alloy.

### Electric Contacts

FUJITSU LTD.

*British Patent 1,517,702*

The erosion of working contacts is reduced by using a low-melting metal, such as Sn or Pb, in combination with a high-melting metal such as Rh or Ru.

### Self-Cleaning Oven

S.A. CIE. EUROPEENNE POUR L'EQUIPEMENT MENAGER "CEPEM"

*British Patent 1,518,230*

A self-cleaning oven has an internal coating of Pd oxide heated by an electrical resistance element.

### Platinum Foil for Optical Circuits

BELL TELEPHONE LABORATORIES INC.

*U.S. Patent 4,073,675*

In the preparation of optical circuits on LiTaO<sub>3</sub> substrates a layer of Pt foil is used.

### Gold-Platinum Alloy for Heating Unit

CORNING GLASS WORKS

*U.S. Patent 4,073,970*

A strip of a Pt-Au alloy is used to form the electrical resistance heating element for an electrical cooking or heating unit.

### Ruthenium Alloy Conductors

INTERNATIONAL BUSINESS MACHINES CORP.

*U.S. Patent 4,075,756*

In the manufacture of integrated circuits a conductor used can be formed of a Ru-Mo alloy.

### Rhodium and Palladium Layers for Semiconductor Device

U.S. PHILIPS CORP.

*U.S. Patent 4,078,963*

A semiconductor device which has a pattern of conductors on a supporting body uses Rh and Pd layers as the base metallisation layers.

### Platinum Catalyst for a Gas Ignition System

MATTHEY BISHOP INC.

*U.S. Patent 4,080,150*

A H<sub>2</sub> pre-ignition device is used to ignite a hydrocarbon gas stream. In the device a small volume of H<sub>2</sub> is mixed with air and passed over a Pt containing catalyst which is activated with Al and is in mesh form. A flame is produced which extends away from the catalyst and is directed so that it intersects the gas stream.

### Lanthanide Phosphors

DAI NIPPON TORYO CO. LTD.

*U.S. Patent 4,081,398*

Fluorescent compositions are described which contain Ir oxide and a phosphor. The phosphor can contain a lanthanide, such as La, Eu or Tb.

### Laser Crystals

H. OPOWER

*German Offen. 2,636,305*

Y-Al perovskite crystals for lasers are obtained by fusing together Cr-doped Al<sub>2</sub>O<sub>3</sub> and lanthanide metal-doped Y oxide in an Ir crucible.

### Vacuum Switch

W. C. HERAEUS G.m.b.H.

*German Offen. 2,638,135*

The contact for the switch is made of a ferromagnetic metal substrate coated with Ti, Zr, Hf, V, Nb and/or Ta and Rh, Ru, Ag, Au or their alloys.

## TEMPERATURE MEASUREMENT

### Platinum Resistance Element

DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT

*U.S. Patent 4,072,593*

A resistance element for a thermometer is produced by sputtering a thin Pt layer on to an insulating solid carrier using Kr/O<sub>2</sub> or Xe/O<sub>2</sub>.

### Gas Stream Speed Measurement

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT

*German Offen. 2,649,040*

Gas flow rates, such as for I.C.E. exhaust gases, are determined by temperature measurement at two locations along the direction of flow, using wire resistors, such as Pt.

## MEDICAL USES

### Platinum

MOBIL OIL CORP.

*U.S. Patent 4,075,307*

$\beta$ -PtCl<sub>2</sub> reacts with gaseous NH<sub>3</sub> to give catalytically active Pt and also complexes of PtCl<sub>2</sub>.nNH<sub>3</sub>, which may be useful in cancer research.

### Dental Alloys

W. C. HEARAEUS G.m.b.H.

*German Offen. 2,638,837*

The alloys contain 50–78% Au, 0.1–8% Pd, 3–36% Ag, 0.5–18% Cu, 1–5% Zn and 1–8% In.

### Branched Chain Amine Complexes of Platinum (IV)

RUSTENBERG PLATINUM MINES LTD.

*South African Appl. 77.1163*

A composition of matter, suitable for the treatment of cancer, comprises a trans-dihydroxy complex of Pt(IV) containing two halogenoid ligands and two branched chain aliphatic amines co-ordinated to the Pt through their N atoms.