

dissolver for stainless steel-UO₂ cermet nuclear fuels. The pilot plant uses a Nb fuel basket and Ti for the dissolver shell, which acts also as the cathode. The full-scale plant would use a Nb anode with a thin Pt sheet on its surface. The stainless steel dissolves in the nitric acid electrolyte by being made anodic. Pt losses were only 0.05 mil/month.

TEMPERATURE MEASUREMENT

The Electrical Resistivity of Thermometrically Pure Platinum below 11°K

J. F. KOS and J. L. G. LAMARCHE, *Canad. J. Phys.*, 1967, **45**, (2, pt.1), 339-354

To extend the use of the Pt resistance thermometer as a standard down to 4.2°K, an interpolation of

the resistance versus temperature function of pure Pt was made to $\pm 0.01^\circ\text{K}$ at 4.2-10°K from calibration points above 10°K and below 4.2°K. Experimental results required a new expression to describe them satisfactorily by accounting for conductivity of electrons in the second band.

Holding at $\pm 0.04^\circ\text{F}$

C. J. CHASSE and R. Y. RUSLING, *Instrumentation*, 1966, **19**, (4), 2-7

The temperature of 17.5 nautical miles of 1 in. diameter undersea cable was maintained at $75^\circ \pm 0.04^\circ\text{F}$ in a water bath for 24 h using ten high grade waterproof thermistors, located at different places in the coiled cable, in conjunction with 2 master thermistors connected to a water proofed platinum resistance thermometer which controlled the temperature of the inflowing water.

NEW PATENTS

METALS AND ALLOYS

Grain-refined Uranium-Aluminium Alloys

U.K. ATOMIC ENERGY AUTHORITY

U.S. Patent 3,285,737

Suitable grain refining agents, for alloys of U with 100-1,500 p.p.m. Al, include Rh, Ir, Os, Ru, Pt, etc.

Tungsten-Ruthenium Alloy

P. R. MALLORY & CO. INC. *U.S. Patent* 3,301,641

An easily worked ductile alloy contains 90% W, 6% Ni, 2% Mo, 1.5% Fe and 0.5% Ru. It may be produced by powder metallurgy.

Spinnerette Alloy

JOHNSON, MATTHEY & CO. LTD.

Belgian Patent 684,532 *Dutch Appl.* 66.10,352

Spinnerettes with uniform alloy structure, resistance to corrosion and small grain size consist of 50-80% Au-0.04-0.5% Ir-Pt, preferably 70% Au-29.8% Pt-0.2% Ir, which is made by induction-melting the constituents, followed by homogenisation by heat treatment.

Platinum-clad Refractory Metal

JOHNSON, MATTHEY & CO. LTD.

Belgian Patent 686,000

Pt group metal is bonded to a refractory metal by using an intermediate barrier layer composed of a mixture of a refractory ceramic material and a metal which is insoluble in one of the metals to be joined but is soluble in the other. In particular, Pt layer on Mo is bonded using Au com-

bined with Al₂O₃, on Nb using Au with Al₂O₃, ZrO₂ or ThO₂.

ELECTROCHEMISTRY

Method and Apparatus for Performing Electrolytic Processes

ALBRIGHT & WILSON LTD. *British Patent* 1,056,889

Electrolytic cells have cathodes of Pt/Ti and anodes of a metal resistant to nascent H, e.g. Cu.

Hydrogen Oxidation in Cells

THE U.S. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION *U.S. Patent* 3,287,174

Pressure build-up in electrochemical cells is prevented by introducing PdO to convert H₂ to H₂O.

Alkali-Chlorine Cell Anode

PITTSBURGH PLATE GLASS CO.

U.S. Patent 3,287,250

The anode has a Pt surface activated by prior exposure as a cathode in an electrolyte inert to Pt.

Noble Metal-coated Valve Metal Electrodes

IONICS INC.

U.S. Patent 3,291,716

Electrodialysis equipment uses Pt/Ta electrodes.

Activation of Metal Surfaces

JOHNSON, MATTHEY & CO. LTD.

German Patent 1,236,302

Surfaces of Pt group metals and their alloys, especially in the form of electrolysis electrodes,

are activated by applying Hg and heating to 160–480°C.

ELECTRODEPOSITION AND SURFACE COATINGS

Metal-coated Insulating Body

INTERNATIONAL BUSINESS MACHINES CORP.

British Patent 1,056,509

An electrically insulating body is coated with a Ni-Pd film by applying to the body a solution of Ni chloropalladate in an organic solvent and heating the applied solution to reduce the salt to Ni-Pd.

Metal-coated Refractories

OWENS-ILLINOIS INC. *British Patent* 1,057,981

Refractories are protected against attack by molten materials, such as glass, by coating them with metal applied by spraying it in a molten state directly on to the surface of the refractory at a velocity of at least 100 ft/sec, the metal containing pure Pt or an alloy of at least 80% Pt.

Alloy Diffusion Process

E. I. DU PONT DE NEMOURS & CO.

British Patent 1,060,328

A Fe metal article is provided with a diffusion coating of a Fe-Pt alloy by contacting the article with a molten mixture of Ca, CaCl₂ and a source of Pt. The Ca forms 0.5–50% of the mixture and the operating temperature is between 800°C and the melting point of the article.

Electroplating

M. & T. CHEMICALS INC. *British Patent* 1,064,295

This is one of a group of patents relating to preferential plating of areas of a cathode having a relatively high H overvoltage. Typically Cr is deposited on steel. This causes problems of electrolyte attack on the usual masking agents and resin. In this specification the areas to be plated are masked, a metal of low H overvoltage (Pt, Pd, Rh, Au or Ir) is applied to the clear areas, the masks are removed and plating carried out using the noble metal as an electrolyte-resistant mask. The process is claimed for steel in 1,064,297.

Electroless Palladium Plating

JOHNSON, MATTHEY & CO. LTD.

U.S. Patent 3,285,754

Plating baths are buffered complexes of nitrito-palladate compounds. This corresponds to *British Patent* 965,859.

Oxidation-resistant Coating for Copper

GENERAL ELECTRIC CO. *U.S. Patent* 3,290,170

The oxidation-resistant coating, e.g. on electrical conductors, contains 62.5% Ga, 21.5% Ir and 16% Sn and, after application, is heated to form an alloy with the Cu.

Electrodeposition of Palladium

TECHNIC INC.

U.S. Patent 3,290,234

The electrolyte consists of a Pd chelate of an N,N'-cyclic alkylenediamine tetraacetic acid dissolved in H₂O with a phosphate conductor and a buffer to hold the pH at 4–12.

Electrodeposition of a Rhodium-Indium Alloy

JOHNSON, MATTHEY & CO. LTD.

U.S. Patent 3,311,547

The brittleness of pure Rh deposits is overcome by addition to an 8–12 g/l Rh plating solution of 0.01–1.0 g/l In as a compatible salt, e.g. sulphate or perchlorate. Plating at 2.5–20 A/ft² produces an In-Rh alloy deposit containing 0.1–1.0% In with only a very slight decrease in hardness compared to pure Rh. This corresponds to *British Patent* 959,062.

Decoration of Metal Surfaces

JOHNSON, MATTHEY & CO. LTD.

French Patent 1,455,917

A metal or alloy differing in colour from the metal base is applied in an organic base and fired to produce slight adherence, the metal or alloy then being embossed with a design. Au, Ag and Pt metals, e.g. in flake form, are suitable decorative materials.

BRAZING

Brazing Alloys for Tungsten, Molybdenum and their Alloys

U.S. ATOMIC ENERGY COMMISSION

British Patent 1,063,274 *U.S. Patent* 3,292,255

The alloys for brazing purposes contain 40–87 wt.% Mo, 5–40 wt.% Ru and 8–55 wt.% Re.

CATALYSIS

Production of Hydrogen Peroxide

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 1,056,121

Hydrogen and oxygen are reacted in the presence of a solid catalyst, e.g. supported Pd, in the presence of a stabiliser for the H₂O₂ produced. (See also 1,056,122–3 and 1,056,125–6.)

Multicomponent, Multifunctional Catalysts

MOBIL OIL CORP.

British Patent 1,056,493

The catalyst claimed is a mixture of a known hydrogenation catalyst, e.g. Pt/Al₂O₃ with an activated crystalline aluminosilicate, both being in particulate form.

Isomerisation Process

UNIVERSAL OIL PRODUCTS CO.

British Patent 1,056,517

A preferred hydrocarbon catalyst contains

Al₂O₃, a Pt group metal and combined halogen, particularly F₂.

Removal of Nitrogen Compounds from Hydrocarbon Fractions

THE BRITISH PETROLEUM CO. LTD.

British Patent 1,057,683

N compounds in hydrocarbon fractions (free from S) are removed over a catalyst comprising a Pt group metal on a support containing a major proportion of Al₂O₃ and a minor proportion of one or more other oxides of elements of Groups III and IV or P.

Preparation of Ethylene Glycol Acetates

E. I. DU PONT DE NEMOURS & CO.

British Patent 1,058,995

These acetates are produced by reacting C₂H₄ with a liquid mixture of (a) a Pd(II) salt, (b) a metal acetate, (c) a metal halide, (d) an oxidising agent, (e) CH₃COOH, and (f) 0.1–10% H₂O.

Dehydrogenation of Alcohols

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 1,060,045

H is removed from an aliphatic or cycloaliphatic primary or secondary alcohol by treating it with a mixture of a Ru, Rh, Os or Ir compound, a stannous salt and LiCl.

Hydrocarbon Conversion Coating

TEXACO DEVELOPMENT CORP.

British Patent 1,061,369

The catalyst is produced by contacting a Pt/Al₂O₃ composite in the presence of O₂ at 149–427°C with an organic chloride activating agent containing at least two C atoms and having an atomic H:Cl ratio of less than 1.0, e.g. C₂H₂Cl₄.

Production of Vinyl Acetate

THE DISTILLERS CO. LTD. *British Patent 1,062,087*

C₂H₄ and O₂ are reacted with a mixture of CH₃COOH, acetate ions, a Pt group metal catalyst and a Co or Mn salt.

Production of Cyclohexanone by Selective Hydrogenation of Phenol

VEB LEUNA-WERKE 'WALTER ULBRICHT'

British Patent 1,063,357

The hydrogenation catalyst consists of 0.3–5 wt.% Pd deposited on γ-Al₂O₃ containing 2–60% of an alkaline earth hydroxide.

Production of Vinyl Esters

E. I. DU PONT DE NEMOURS & CO.

British Patent 1,063,434

C₂H₄ is reacted with an CH₃COOH solution of a Pd salt, an ionisable metal acetate, a cupric salt and a metal chloride or bromide in specified conditions, the Pd salt concentration being 0.001–0.1 M. 1,063,435 describes a different set of operating conditions with the same catalyst.

Catalysts for Hydrocracking

ESSO RESEARCH & ENGINEERING CO.

British Patent 1,063,819

An improved support for a Pt metal is a molecular sieve zeolite with pore openings of 6–15 Å and a SiO₂-Al₂O₃ ratio of at least 3:1 which has been treated with a non-reducing gas containing 0.2–5 vol.% halogen at 650–1,200°F.

Preparation of Vinyl Acetate

RHONE-POULENC S.A. *British Patent 1,063,938*

C₂H₄, CH₃CHO and O₂ are reacted in an inert solvent at 60–200°C in the presence of a finely divided Group VIII metal catalyst, e.g. divided Os, Ru, Pd, Pt, Rh or Ir.

Production of Esters

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 1,064,066

A mixture of vinyl acetate and CH₃CHO is produced by contacting C₂H₄ and O₂ with a Pd salt in the presence of CH₃COOH and a redox system.

Preparation of Acid Halides

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 1,065,343

The replacement of ring H atoms by carboxylic acid halide groups in aromatic compounds is catalysed by Group VIII metals, e.g. Pd or Rh.

Catalysts for Acetal Production

UNION OIL CO.

U.S. Patent 3,285,970

A 2–5C alpha-olefine is oxidised to an acetal with O₂ in an alcohol solvent with a Pt metal and a strong acid as catalyst, e.g. PdCl₂ and HCl.

Platinum-Rhenium Anodic Oxidation Catalyst

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,287,171

This catalyst is obtained by coreducing a Pt salt and a Re salt with an alkali metal borohydride.

Increased Activity Hydrocracking Catalyst

UNION OIL CO.

U.S. Patent 3,287,256

The activity of Group VIII metals (e.g. Pd) on molecular sieve supports is improved by pre-sulphiding and oxidising. 3,287,257 is virtually identical.

Hydrogenation of Aldehydic Peroxides

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,287,283

Hydrogenation catalysed by Pt or the like produces hydroxy esters.

Hydrocarbon Conversion Process

TEXACO INC.

U.S. Patent 3,287,439

Paraffins are isomerised by elevated temperature contact with Pt/Al₂O₃ containing Cl₂ and F₂.

Organic Group VIII Hydrogenation Catalyst
CABOT CORP. U.S. Patent 3,288,725

New catalysts are supported Group VIII metals, e.g. Pd, Pt or Ru, in the form of π -bonded organic halide complexes, e.g. 1,5-cyclooctadiene platinum dichloride.

Selective Hydroformylation of Olefines

DIAMOND ALKALI CO. U.S. Patent 3,290,379

The catalyst for this process is a dicobalt, dirhodium or diiridium octacarbonyl modified with a phosphite.

Hydrocarbon Hydrocracking Process

W. R. GRACE & CO. U.S. Patent 3,291,720

The catalyst for this process contains 0.5–5% Rh sulphide with a Rh:S atomic ratio of 0.5–0.9, preferably on a $\text{SiO}_2/\text{Al}_2\text{O}_3$ support.

Catalyst for Saturated Hydrocarbon Dehydrogenation

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,291,755

The composite catalyst has the composition 0.01–1.5% Li and 0.05–5.0% Group VIII metal, such as Pt, and As, Sb or Bi in a ratio to the Group VIII metal of about 1:0.2–0.45.

Selective Isobutane Production

CHEVRON RESEARCH CO. U.S. Patent 3,291,852

Light distillates are converted continuously to *iso*- C_4H_{10} by contact, in the presence of H_2 , with a noble metal catalyst on Al_2O_3 containing 2–7 wt.% halogen, especially Pt/F/ Al_2O_3 .

Catalytic Dehydrogenation of Paraffinic Hydrocarbons

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,291,855

Paraffins are dehydrogenated using an Al_2O_3 support coated with at least one metallic component selected from the metals of Groups VI and VIII, preferably Pt or Pd.

Hydroforming with a Platinum Metal Catalyst

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,296,118

A platinised or palladised fluoro/chloro-alumina catalyst is used for reforming in a recycling process. See also 3,296,119.

Production of Diene Polymers

PHILLIPS PETROLEUM CO. U.S. Patent 3,296,227

Dienes are polymerised to the *trans*-configuration using Rh nitrate as catalyst dissolved in a 2-ethylenic alcohol, e.g. 2-propen-1-ol.

Paraffin Dehydrocyclodimerisation

CHEVRON CORP.

U.S. Patent 3,296,324

The catalyst for the cyclisation of lower molecular

weight paraffins is a Group VIII metal on an acid Al_2O_3 support. Suitable metals are Pd and Pt.

Hydrocracking Catalyst

TEXACO INC.

U.S. Patent 3,297,564

Middle oils are hydrocracked to premium gasolines using a catalyst which is a mixture of an Fe group oxide or sulphide and a Pt and/or Rh metal, oxide or sulphide on an $\text{SiO}_2\text{-Al}_2\text{O}_3$ support. Co and Rh sulphides are suitable.

Nitro-olefine Hydrogenation

ATLANTIC RICHFIELD CO. U.S. Patent 3,297,769

A 1-nitroparaffin is obtained from the corresponding olefine by hydrogenation in the presence of a Pd/C catalyst.

Catalyst for Dehydroaromatisation

THE STANDARD OIL CO. (OHIO)

U.S. Patent 3,297,773

Aromatic compounds are produced from aliphatic compounds in the presence of a Pd, Pt or Ir salt of a silicotungstic acid of formula $\text{SiO}_2 \cdot x\text{WO}_3 \cdot y\text{H}_2\text{O}$, where x is 1–24 and y is 2–30.

Vinyl Acetate Production

ASAHI KASEI K.K.K.

U.S. Patent 3,300,528

CH_3COOH , C_2H_4 and O_2 are reacted in the gas phase over a mixture of Cu with Pt, Rh, Ru or Ir.

Polyalkylated Benzenes from Ketones

UNION OIL CO.

U.S. Patent 3,301,912

A ketone is condensed at 400–900°F in the presence of Pd on a composite $\text{Al}_2\text{O}_3\text{-MoO}_3$ support to give a polyalkylated C_6H_6 .

Catalytic Isomerisation of Paraffin

MOBIL OIL CORP.

U.S. Patent 3,301,917

The catalyst for hydroisomerisation is a mixture of a rare earth zeolite and a supported Pt catalyst.

Platinum-Ruthenium Mixed Oxide Catalysts

JOHNSON, MATTHEY & CO. LTD.

U.S. Patent 3,305,402

Catalysts for oxidation, reduction and electrochemical processes are produced by fusing a mixture of Pt and Ru compounds with NaNO_3 to form an intimate mixture of 90–99 wt.% Pt oxide and 1–10 wt.% Ru oxide and applying this to a suitable catalyst carrier or porous electrode matrix. This corresponds to *British Patent* 1,016,058.

Noble Metal Catalyst

JOHNSON, MATTHEY & CO.

French Patent 1,445,176

An improved catalyst especially for olefine isomerisation consists of a salt such as RhCl_3 or PdCl_2 dissolved in a virtually non-volatile hydroxylic compound, e.g. propylene glycol, optionally dissolved on an inert porous support.

Noble Metal Oxide Catalysts

JOHNSON, MATTHEY & CO. LTD.

French Patent 1,445,177

New catalysts are mixtures of oxides of two Pt metals (except Os), e.g. Rh/Ru, Pt/Ir and Ir/Pd.

Hydrogenation of Cinnamaldehyde

JOHNSON, MATTHEY & CO. LTD.

Belgian Patent 685,368 Dutch Appl. 66.11,392

Selective hydrogenation of unsaturated aldehydes, in particular of cinnamaldehyde to cinnamyl alcohol, is catalysed by supported Pt metals in alcoholic solutions with alkali promoters. Catalysts include $\geq 5\%$ Pt/charcoal, Ru-Pt/charcoal, Pt/Al₂O₃.

FUEL CELLS

Fuel Cells

LEESONA CORP.

British Patent 1,063,065

A more efficient cell with electrodes of longer life has at least one electrode made of Pd alloyed with 1-88% Au, particularly a finely divided 35-82% Au alloy on a porous support.

Metallised Sheet Electrodes

AMERICAN CYANAMID CO. *British Patent 1,064,554*

A H₂-O₂ fuel cell electrode consists of (a) 20-60% fibrous support, (b) 1-25% H₂O-repellent compound, (c) 1-25% metallic catalyst and (d) 25-50% of an electrically conducting non-catalytic filler. The preferred catalyst is Pt, Pd or Ru.

Electrode for Fuel Cells

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,288,653

A non-porous electrode consists of an electrically conductive metal base plate with a metal screen welded to it and a finely divided metal catalyst pressed into the mesh of the screen. Thus a Pt-Ir alloy catalyst can be pressed into a Pt wire mesh welded to a Pt base plate.

Fuel Cell Electrodes

LEESONA CORP.

U.S. Patent 3,291,643

The fuel electrode consists of a H₂-diffusion, non-porous Pd-Ag membrane coated on the front surface at least with a thin film of Group VIII metal black. The metal black is preferably Pd.

Fuel Cell Electrodes

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,296,102

The electrode consists of an electrically conductive base on which Pt black catalyst has been deposited at a reduction potential of +0.05 to -0.08 V and at a current density of 2-10 A/ft².

Fuel Cell Catalyst

AMERICAN CYANAMID CO. *U.S. Patent 3,297,490*

The catalyst, such as a Pt metal, has a new

improved type of conducting support obtained by the pyrolysis of N-C polymer.

GLASS TECHNOLOGY

Apparatus for Use with Molten Oxide Mixtures and Glasses

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT

British Patent 1,064,474

Apparatus coming into contact with aggressive melts is made of a ductile alloy of 2-10% Rh, 0.5-10% Pd and the balance Pt.

Metals and Alloys in Contact with Molten Metals

COMPTOIR LYON-ALLEMAND LOUYOT ET CIE.

U.S. Patent 3,294,525

Articles in contact with high temperature molten materials, especially glass, are manufactured from a Pt metal in sponge form which is compressed, sintered and degassed in a vacuum.

Alloy Resistant to Wetting by Glass

JOHNSON, MATTHEY & CO. LTD.

Belgian Patent 682,754 Dutch Appl. 66.08,455

An alloy for use in the glass industry consists of 60-97 wt.% Pt-2-25 wt.% Rh-1-10 wt.% Au.

ELECTRICAL AND ELECTRONIC ENGINEERING

Vitreous Compositions

E. I. DU PONT DE NEMOURS & CO.

British Patent 1,062,378

A composition for application and firing on to a dielectric ceramic, to form an electrically conductive film which may be soldered, consists of 8-25% finely divided Pd, 55-84% finely divided Au and 8-37% of a finely divided vitreous binder.

Electrical Resistors

THE TELEGRAPH CONDENSER CO. LTD.

British Patent 1,063,034

The resistor has a metal film, preferably a noble metal-base metal alloy and metal electrodes, e.g. of Au-Pt alloy.

Commutators

THE SPERRY GYROSCOPE CO. LTD.

British Patent 1,063,093

A commutator is made by cutting an insulating body to the requisite size, applying a conducting coating, e.g. chemically deposited Cu and then plating, e.g. with Rh.

Superconducting Compositions

AMERICAN CYANAMID CO. *U.S. Patent 3,295,931*

The new conductors consist of three elements: (a) Pd or Pt, (b) Sb or Bi, or (c) Se or Te, e.g. PdSbSe or PtBiSe.