

## TEMPERATURE MEASUREMENT

### Thermocouples for Measurement of High Temperatures

B. I. STADNYK and G. V. SAMSONOV, *Teplofiz. Vysokikh Temp.*, 1964, 2, (4), 634-637

Thermocouple materials and sheaths are reviewed. Pt metal combinations are Pt: 10% Rh-Pt, 20% Rh-Pt: 40% Rh-Pt, 5% Rh-Pt: 20% Rh-Pt, 6% Rh-Pt: 30% Rh-Pt, Rh: 20% Rh-Pt, Rh: 30% Rh-Pt, Rh: 8% Re-Pt, Pt: Re, Ir: 40% Rh-Ir, and Ir: 60% Rh-Ir.

## NEW PATENTS

### METALS AND ALLOYS

#### Palladium or Palladium Alloy Diffusion Tube for the Separation of Hydrogen from Gaseous Mixtures

JOHNSON, MATTHEY & CO LTD.  
*British Patent* 966,122

A diffusion tube used for the separation of H<sub>2</sub> from gaseous mixtures made of pure Pd or 75 wt.% Pd-25 wt.% Ag alloy, is made more robust and its life is prolonged by the incorporation of stainless steel or Ni coil springs or metal or ceramic rods as stiffening members, which prevent flattening of the tube walls yet permit free passage of gas.

#### Rhodium-containing Magnetic Alloys

E. I. DU PONT DE NEMOURS & CO.  
*U.S. Patent* 3,144,324

Ferromagnetic materials exhibiting very good saturation magnetisation values and high Curie temperatures comprise in at.% 0.8-1.2 Fe, 0.8-1.2 Rh and 0.01-0.20 of at least one metal of Group IIA atomic no. 4-12 or Group IIIA, IVA, VA or VIA atomic no. 13-83, e.g. Al, Mg, Ge, Si, Sb, S, Ga, etc. See also 3,144,325.

#### Gold-Platinum Spinneret Alloy

DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT  
*German Patent* 1,175,886

The material used for spinnerets, especially for viscose, is unhardened and homogeneous and consists of 68-88% Au and 12-32% Pt. See also 1,177,350.

#### Easily Worked Ruthenium

INTERNATIONAL NICKEL CO. (MOND) LTD.  
*German Patent* 1,177,349

Ru which is easily formed is obtained by melting Ru in the presence of one or more of the metals Zn, Cd, Bi, Ti, Ge, Ba, Hf, Ce, Er, Gd, Hm, La, Pr, Sm, Yb and Y. Zn is preferred.

### Results Obtained from Measurements on Platinum Resistance Thermometers at the Thermometry Section of the Kamerlingh Onnes Laboratorium, Leiden

H. VAN DIJK, *Physica*, 1964, 30, (8), 1498-1512

Tests on 27 Pt resistance thermometers at 1.5-4.3°K, 9-20.3°K and 54-90°K gave the temperature dependence of reduced resistance  $\omega = R/R_0^{\circ}C$  for the range 1.5-90°K. Calibration at more than a few temperatures is needed, particularly for 4.2-10°K.  $\omega = \omega_0 + AT^2 + BT^5$  for 1.5-4.2°K, where  $\omega_0$ , A and B varied accordingly to the origin and purity of the Pt.

### Gold Alloy Coatings on Wire

SIEMENS & HALSKE A.G. *German Patent* 1,178,273  
Very thin Mo and W wires for electrical discharge devices may be successfully coated with an Au alloy by using an alloy of Au with 3-30 wt.% Pt and at least 3% Ni or Fe.

### ELECTROCHEMISTRY

#### Platinum Group Metal Coated Electrode for Electrochemical Processes

DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT  
*British Patent* 965,958

An electrode particularly suitable for alkali-metal chloride electrolysis consists of a large flat area formed by many separate elements, each of which consists of a Cu core surrounded by a layer of Ti coated with a Pt group metal.

#### Electrolytic Production of Hydrogen

JOHNSON, MATTHEY & CO. LTD.  
*British Patent* 973,810

Extremely pure H<sub>2</sub> is produced efficiently by electrolysis using 1% H<sub>2</sub>SO<sub>4</sub> solution as electrolyte and a membrane, diaphragm or tube cathode made of an alloy containing 5-30 wt.% Ag and the balance Pd.

#### Method of Separating Hydrogen Isotopes

JOHNSON, MATTHEY & CO. LTD.  
*British Patent* 973,820

H isotopes for the manufacture of deuterium as "heavy water" are separated by electrolysis or by electrolytic migration using a membrane, diaphragm or tube diffusion element made of an alloy containing 5-30 wt.% Ag and the balance Pd.

#### Palladium and its Alloys in the Manufacture of Platinised Noble Metal Electrodes

INSTITUT FRANCAIS DU PETROLE, DES CARBURANTS ET LUBRIFIANTS. *French Patent* 1,354,801  
Platinised electrodes of improved activity are

produced by immersing an Au, Pt or Pd metal electrode in an electrolyte containing haloplatinic acid and 50–200 mg/l of a dissociated Pb salt and applying 150–350 mV at 25°C.

### Platinum Electrodes for Electrolytic Cells

PITTSBURGH PLATE GLASS CO.

*French Patent* 1,360,905

The electrolytic cells used for the production of Cl<sub>2</sub> and alkali metal derivatives are provided with an anode whose active surface is platinised and whose support may be Ti or Ta. If desired other Pt group metals may be used, the thickness of the active film being varied and the performance of the anode improved by a "cationic" treatment.

### Combined Electrolysis Electrode

MAGNETO-CHEMIE N.V. *Dutch Application* 289,280

An electrode combined with a diaphragm consists of a perforated massive plate of Ti, covered on one side with a barrier layer of TiO<sub>2</sub> and on the other side with a thin porous layer of noble metal or alloy, e.g. a 70:30 Pt-Ir alloy.

## ELECTROPLATING

### Platinum Electroplating Electrolyte

COMPTOIR LYON-ALLEMAND, LOUYOT & CIE

*French Patent* 1,356,353

The electrolyte is a solution containing Pt (II) diamminodinitrate to which 5–40 g/l of fluoroborate ions have been added as a hot aqueous solution.

## BRAZING

### Gold-Palladium-Nickel Brazing Alloys

AEROJET-GENERAL CORP. *U.S. Patent* 3,148,053

Improved brazing alloys suitable for use in a vacuum furnace comprise 1–77 wt.% Au, 1–59 wt.% Pd and 20–61 wt.% Ni, Cr or their mixtures.

### Braze-welding of Graphite to Refractory Materials

SOCIETE NATIONALE D'ETUDE ET DE CONSTRUCTION ET MOTEURS D'AVIATION *French Patent* 1,355,568

Two pieces of graphite may be welded to each other or graphite may be braze-welded to a refractory metal, e.g. Hf, Ta, W, Zr, etc., by interposing between the workpieces a brazing flux consisting of one or several refractory metals and 1–50 wt.% Ru, Rh, Pt, Pd, Ir or Os.

## CATALYSIS

### Ruthenium Catalysts for the Hydroformylation of Olefines

IMPERIAL CHEMICAL INDUSTRIES LTD.

*British Patent* 966,482

Olefines are hydroformylated by bringing them,

together with a 3:1 to 1:3 by volume mixture of CO and H<sub>2</sub>, into contact with a catalyst containing 0.0005–0.01 wt.% Ru in the form of the metal or a compound and carrying out the reaction at 140–200°C and 200–300 atm.

### Deuterium Enrichment of Hydrogen

V. E. B. VAKUTRONIK

*British Patent* 967,000

Reference is made to the use of a Pt/C catalyst in a process for the D<sub>2</sub> enrichment of H<sub>2</sub> or the production of heavy water.

### Olefine Hydrogenation in the Presence of Aromatic Hydrocarbons

ENGELHARD INDUSTRIES INC.

*British Patent* 967,879

Dienes in a mixture containing dienes, olefines and aromatic compounds (boiling range 100–400°F) are hydrogenated by contacting the mixture with H<sub>2</sub> and a Pt/Al<sub>2</sub>O<sub>3</sub> catalyst at a temperature not exceeding 210°F in conditions such that 90% of the material remains in the liquid phase.

### Hydrogenation of Benzoic Acid

SNIA VISCOSA S.p.A.

*British Patent* 967,918

Benzoic acid is hydrogenated to hexahydrobenzoic acid using a finely subdivided H<sub>2</sub> stream and a supported Pd catalyst. See also 967,919.

### Selective Hydrogenation of Hydrocarbons in the Liquid State

FARBENFABRIKEN BAYER A.G.

*British Patent* 968,337

A hydrocarbon mixture containing acetylenes, allenes and other diolefines is hydrogenated selectively by passing it in the liquid state and in an atmosphere of H<sub>2</sub> over a Pd/Al<sub>2</sub>O<sub>3</sub> catalyst through nets of 30–70 mm diameter vertical reaction tubes which are externally cooled.

### Palladium Catalyst in the Production of Benzonitrile

THE DISTILLERS CO. LTD. *British Patent* 968,752

Benzonitrile is produced by the vapour phase dehydrogenation of a hydrogenated derivative at 400–500°C over a Pd/C catalyst containing about 1 wt.% metal.

### Platinum Group Metal Reforming Process Catalyst

UNIVERSAL OIL PRODUCTS CO.

*British Patent* 969,789

A hydrocarbon reforming catalyst is produced by calcining a hydrous refractory inorganic oxide followed by compounding to give 0.01–2.0 wt.% Pt group metal and 0.75–1.5 wt.% Cl<sub>2</sub> and subsequently oxidising at 204–310°C for at least one hour, followed by treatment at 371–538°C to give a volatile matter content of <2.0 wt.%.

### Production of Organic Bases

IMPERIAL CHEMICAL INDUSTRIES LTD.

*British Patent 969,812*

Organic bases are prepared by contacting a mixture of tetrahydrofurfuryl alcohol and  $\text{NH}_3$  at elevated temperature with a catalyst of finely divided Pd preferably supported on  $\text{Al}_2\text{O}_3$ .

### Production of Porous Electrodes

BROWN, BOVERI & CO. LTD. *British Patent 970,576*

The porous catalyst electrodes for electrochemical devices may be produced by mixing a powder of one or more of Pt, Ir, Rh and Pd with a powder of one or more of Al, Zr, Mg, W, Mo and Fe, in a 30–95 wt.% to 5–70 wt.% ratio, shaping under pressure, sintering at 350–800°C and treating with an alkaline or acidic solution to dissolve out the second metal.

### Palladium and Platinum Catalysts in the Production of Acetic Acid

HALCON INTERNATIONAL INC.

*British Patent 971,100*

$\text{CH}_3\text{COOH}$  is produced by contacting a gaseous mixture of  $\text{C}_2\text{H}_4$  and  $\text{O}_2$  at 150–300°C and 1–1000 atm. with a catalyst comprising a ceramically bonded  $\alpha\text{-Al}_2\text{O}_3$  supporting 0.1–5 wt.% Pt or Pd salt or oxide and 1–20 wt.% V, Co, Mo or Mn salt or oxide.

### Catalytic Treatment of Automobile Exhaust Gases

W. R. GRACE & CO. *British Patent 971,994*

Pollutants in automobile exhaust gases are oxidised catalytically by mixing them with an  $\text{O}_2$ -containing gas and contacting with an activated mixture of (1) 10–100 $\mu$  particle size  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2\text{-Al}_2\text{O}_3$  or  $\text{MgO}_2$  or acid-treated clay containing Pt and Pd in a 0.125–2.0 Pt:Pd wt.ratio and (2) finely divided, porous  $\text{Al}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3\text{-B}_2\text{O}_3$ ,  $\text{-TiO}_2$  or  $\text{-ZrO}_2$  diluent providing a 5–250 dilution ratio and giving a 0.005–0.2 wt.% final content each of Pt and Pd.

### Platinum Catalyst in the Production of Fuel Gas and Synthesis Gases

BADISCHE ANILIN- & SODA-FABRIK A.G.

*British Patent 972,263*

In the production of fuel and synthesis gases by the catalytic cracking of hydrocarbons in a fluidised bed comprising a refractory oxide support carrying Pt as the active metal, the catalyst is replenished by introducing into the bed a decomposable compound of the active metal, e.g. a carbonyl.

### Hydrocarbon Isomerisation Catalysts

UNION CARBIDE CORP. *British Patent 972,832*

An isomerisation catalyst comprises a partially decationised zeolitic metal aluminosilicate molecular sieve supporting 0.05–2.0 wt.% Group VIII metal, in particular Pt or Pd.

### Portable I.R. Spot Heater

UNIVERSAL OIL PRODUCTS CO.

*British Patent 972,942*

A portable I.R. spot heater utilising liquefied gases uses a perforate diffusion screen made of "Nichrome" "Chromel" or other Cr/Ni alloy and catalytically activated by a coating of Pt, Pd or other Pt group metal, which may be used in conjunction with smaller amounts of Th, Ru, W or Cs.

### Cycloheptylamine Production

ABBOTT LABORATORIES. *U.S. Patent 3,139,454*

The hydrogenation of cycloheptanone oxime to cycloheptylamine is catalysed by 0.3–3.0% Rh when low hydrogen pressures and temperatures of 0–100°C are used.

### Benzoic Acid Hydrogenation

ALLIED CHEMICAL CORP. *U.S. Patent 3,141,036*

Molten benzoic acid may be hydrogenated to cyclohexane carboxylic acid by treatment with  $\text{H}_2$  at 1–40 atm. in the presence of a catalyst composed of palladised charcoal.

### Platinum Catalysts in the Production of Lubricating Oils

SOCONY MOBIL OIL CO. INC. *U.S. Patent 3,142,635*

Catalysts consisting of 0.5–1.0 wt.% Pt supported on  $\text{SiO}_2/\text{Al}_2\text{O}_3$  are used in the production of high viscosity-index lubricating oils by the hydrocracking of 750–850°F b.p. straight run fractions.

### Platinum Hydrocracking Catalysts

ESSO RESEARCH & ENGINEERING CO.

*U.S. Patent 3,143,511*

An improved paraffin hydrocracking catalyst is produced by contacting  $\text{Al}_2\text{O}_3$  impregnated with 0.1–5 wt.% Pt with  $\text{FeCl}_3$  vapour at 500–950°F and moist air to effect hydrolysis, this being followed by reduction to obtain a 0.1–5 wt.% Fe content on the catalyst.

### Platinum or Palladium Series Hydrocracking Catalysts

SOCONY MOBIL OIL CO. *U.S. Patent 3,144,401*

Hydrocarbon fractions are advantageously hydrocracked by contacting them and hydrogen with 0.05–10 wt.% Pt or Pd series metal deposited on a refractory oxide and adding S compounds so as continuously to maintain a 0.5–5 wt.% S content during the hydrocracking process.

### Noble Metal Catalysts for the Polymerisation of Olefinically Unsaturated Compounds

WACKER-CHEMIE G.m.b.H.

*U.S. Patent 3,145,194*

Copolymers and polymers of olefinically unsaturated compounds are produced by contacting them at –80 to +50°C with 0.001–0.5 wt.% inorganic per-compound, organic peroxide or

hydroperoxide,  $H_2$  at 0.1–10 atm. partial pressure and 0.0001–0.1 wt.% aqueous colloidal sol of a Pt group metal.

#### Platinum Hydrogenation Catalysts

E. I. DU PONT DE NEMOURS & CO.

*U.S. Patent 3,145,231*

Halogen-substituted aromatic amines are produced by the hydrogenation of nitro-mono-carbocyclic aromatic hydrocarbons at 30–150°C and 200–600 p.s.i.g.  $H_2$  pressure in the presence of 1 part Pt per 10000–100000 parts nitro compound and 0.01–1.5 moles cycloaliphatic base per 1 mole nitro compound.

#### Platinum Group Metal Catalysts in the Production of Carbonyl Compounds

THE PURE OIL CO.

*U.S. Patent 3,147,203*

Carbonyl compounds are produced by oxidation of at least one olefine at 0–200°C in the presence of an aqueous catalytic solution of a Pt group metal halide and by an electrochemical process involving regeneration of the catalyst and utilising Raney Ag, Pt, Cu, Ni, etc., electrodes.

#### Platinum Group Metal Hydro-refining Catalysts

ESSO RESEARCH & ENGINEERING CO.

*U.S. Patent 3,147,229*

Pt group metal catalysts of improved activity and of longer life are produced by (1) activation of  $Al_2O_3$  by calcining to give a surface area of  $230 \pm 20$   $m^2/g$  (2) impregnating with Pt, Pd or Rh and activating the catalyst by calcining above 1000°C and (3) halogen-treating the product under conditions giving an active metal surface of  $200 \pm 20$   $m^2/g$  Pt or  $380 \pm 38$   $m^2/g$  Pd or Rh.

#### Platinum Catalyst for the Oxidation of Exhaust Gases

UNIVERSAL OIL PRODUCTS CO.

*U.S. Patent 3,148,036*

An improved arrangement of an exhaust gas converter uses, as the oxidation catalyst,  $Al_2O_3$  spheres supporting 0.1 wt.% Pt.

#### Palladium Hydrogenation Catalyst in the Production of Aminophenols

UNIVERSAL OIL PRODUCTS CO.

*French Patent 1,354,430*

Aminophenols are produced by the hydrogenation of corresponding nitrophenols with  $H_2$  in the presence of Pd/C catalysts at 25–100°C, 1–35 atm.

#### Precious Metal Catalysts in the Production of Olefinic Esters

UNION CARBIDE CORP. *French Patent 1,355,109*

Olefinic esters are produced by the reaction in an inert solvent at 70–130°C of an olefine and a mono-carboxylic acid in the presence of a Pt group metal as catalyst.

#### Alumina-supported Palladium Hydrocracking Catalysts

GULF RESEARCH & DEVELOPMENT CO.

*French Patent 1,355,210*

Low b.p. hydrocarbons are produced by the hydrocracking of hydrocarbon distillates in the presence of a catalyst consisting of an active  $Al_2O_3$  support, obtained by precipitation of  $Al(OH)_3$  at pH 7–8.5, carrying up to 16 wt.% Mo or W oxide and/or sulphide and about 1 wt.% Pd sulphide or oxide. The use of Pt in the place of Pd compounds is possible.

#### Hydrocracking Process and Catalyst for Hydrocarbon Oils

SHELL INTERNATIONALE RESEARCH MIJ. N.V.

*French Patent 1,356,567*

Improved supported Pt or Pd catalysts are obtained by co-precipitating the support oxides as a hydrogel in the presence of compounds of the catalyst metals and then processing the product to a catalyst in the usual way.

#### Cycloalkanone Oxime Production

SICEDISON S.p.A.

*French Patent 1,357,233*

2-Halocycloalkanone oximes are dehalogenated in organic solution with a strong acid by using  $H_2$  with a palladised charcoal catalyst.

#### Platinum and Palladium in the Production of Acetic Acid

SCIENTIFIC DESIGN CO. INC.

*French Patent 1,358,382*

$CH_3COOH$  is produced by the catalytic gaseous phase oxidation of  $C_2H_4$  with  $O_2$  at 200–250°C in the presence of a catalyst comprising  $Al_2O_3$  supporting 0.1–5 wt.% Pd or Pt and 5–20 wt.% V, Co, Mo or Mn, preferably in the form of their halides and oxides respectively.

#### Platinum Dehydrogenation Catalyst

SCIENTIFIC DESIGN CO. INC.

*French Patent 1,358,386*

A catalyst consisting of active C, which has been treated with 0.1–19% HCl and has been washed and impregnated with up to 5% Pt is used in the production of phenol by the dehydrogenation of the heavy fraction arising from the oxidation of cyclohexane.

#### Precious Metal Hydrodealkylation Catalysts

UNION CARBIDE CORP.

*French Patent 1,358,439*

Alkyl-substituted aromatic hydrocarbons are hydrodealkylated by contacting them at 400–650°C in a  $H_2$  atmosphere with a molecular sieve constituted by zeolitic aluminosilicate and carrying a small proportion of, inter alia, Pt or Pd.

#### Platinum Group Halogenation Catalysts

IMPERIAL CHEMICAL INDUSTRIES LTD.

*French Patent 1,359,016*

Halogenated hydrocarbons are produced by

contacting an olefine, HX and a source of O<sub>2</sub> at 200–600°C with a catalyst comprised by an inert support and a Pt group metal, preferably Pt or Pd.

### **Rhodium Catalyst for Reduction of Organonitro Compounds**

ABBOTT LABORATORIES *French Patent 1,359,438*  
The hydrogenation of nitro-aromatic compounds at 20–150°C and 1 atm. to 10.5 kg/cm<sup>2</sup> H<sub>2</sub> in the presence of 0.01–2.0 wt.% Rh catalyst results in the formation of the corresponding aromatic amines.

### **Palladium-containing Catalyst for the Oxidation of Exhaust Fumes**

W. R. GRACE & CO. *French Patent 1,359,988*  
A catalyst suitable for incorporation into filters for the exhaust systems of internal combustion engines comprises a high specific area refractory oxide support carrying 2–20 wt.% CuO, 0.0025–0.1 wt.% Pd and 1–10 wt.% Cr<sub>2</sub>O<sub>3</sub>.

### **Platinum Oxide Catalyst in the Production of Ornithine**

SHELL INTERNATIONALE RESEARCH MIJ. N.V.  
*French Patent 1,360,750*

In the production of ornithine from acrolein and cyanuric hydride the hydrogenation step is carried out in the presence of a PtO catalyst.

### **Platinum Alloy or Mixture Catalysts in the Production of Hydroxylamine**

INVENTA A. G. *French Patent 1,360,983*  
Hydroxylamine is produced by reduction of nitrogen oxide in acid solution at pH 0.5–2.5, at 65–80°C and in the presence of 0.4–1.0 mole hydroxylamine salt and Pt, Ag, NO<sub>3</sub>-impregnated Pt or a Pt alloy with Ag, Hg, Au, Ir or Pd as catalyst supported on a suitable material.

### **Rhodium Catalyst in the Production of Alpha-acyloxy-propionaldehydes**

AJINOMOTO CO. INC. *French Patent 1,361,797*  
The reaction in a liquid phase at elevated temperatures and pressures between a vinyl ester of fatty acids and H<sub>2</sub> and CO in the presence of a Rh catalyst yields  $\alpha$ -acyloxy-propionaldehydes.

### **Precious Metal Hydrogenation Catalysts**

SHIONOGI & CO. LTD. *French Patent 1,361,980*  
Unsaturated morphinanes may be hydrogenated with H<sub>2</sub> in the presence of a Pt or Pd catalyst.

### **Production of Hydrogen Cyanide**

IMPERIAL CHEMICAL INDUSTRIES LTD.  
*German Patent 1,173,444*  
The NH<sub>3</sub>/CH<sub>4</sub> reaction of this process is catalysed by a Pt metal or alloy catalyst which has been activated by pretreatment with reaction mixture to which S has been added.

### **Lubricating Oil Production**

UNIVERSAL OIL PRODUCTS CO.  
*German Patent 1,174,007*

A crude oil fraction with at least 95% of its components, including condensed ring naphthalenes, boiling above 285°C is hydrogenated in the presence of a Pt metal catalyst, supported on a non-acidic carrier, to provide a lubricant feedstock.

### **Tetrafluorodichloroisopropanol Production**

ALLIED CHEMICAL CORP.  
*German Patent 1,176,118*

Symmetrical tetrafluorodichloroisopropanol is produced from the corresponding ketone by hydrogenation over a Pt catalyst in the liquid phase.

### **Production of Organic Carbonyl Compounds**

CONSORTIUM FUR ELEKTROCHEMISCHE INDUSTRIE  
*German Patent 1,176,141*

The C=C double bond of olefines is converted to CHO or CO by reaction with aqueous Pt metal salts, e.g. PdCl<sub>2</sub>.

### **Hydrocarbon Conversion Process**

STANDARD OIL CO. *German Patent 1,176,306*

The hydroforming of hydrocarbons is carried out in the presence of a Pt/Al<sub>2</sub>O<sub>3</sub> catalyst which is regenerated in cycles to restore its HF-soluble content to  $\leq$  40 wt.% of the Pt.

### **Uranium Nitrate Solution Production**

COMITATO NAZIONALE PER L'ENERGIA NUCLEARE  
*German Patent 1,176,631*

Uranyl nitrate solutions are reduced to uranium nitrate solutions by means of gaseous hydrogen in the presence of a Pt catalyst. See also 1,176,632.

### **Continuous Vinyl Ester Production**

CONSORTIUM FUR ELEKTROCHEMISCHE INDUSTRIE  
*German Patent 1,176,645*

Olefines are reacted with a carboxylic acid and a supported Pt catalyst. The catalyst is reoxidised after the vinyl ester has been removed.

### **Catalyst for Organic Compound Hydrogenation**

ENGELHARD INDUSTRIES INC.  
*German Patent 1,176,656*

A catalyst especially active for aldehyde and ketone reduction consists of Ru promoted by another Pt metal on a support containing 0.1–10% total catalyst metal of which at least 20 wt.% is Ru.

### **Production of Alkyl Aromatic Compounds**

BATAAFSCHE PETROLEUM MIJ. N.V.  
*German Patent 1,178,065*

Diaryl alkanes are converted to alkyl aromatic

compounds by heating at 300–600°C in the presence of a refractory metal oxide catalyst and also a Pt or Pd dehydrogenation catalyst.

### Aldehyde and Ketone Production

FARBWERKE HOECHST A. G.  
*Dutch Application* 249,648

Alkenes with 3 or more C atoms are reacted with O<sub>2</sub> in the presence of H<sub>2</sub>O, a redox system and a noble metal catalyst, preferably at least 0.25 mol/l of a Pd compound such as PdCl<sub>2</sub>.

### Selective Hydrogenation of Ethynes

IMPERIAL CHEMICAL INDUSTRIES LTD.  
*Dutch Application* 253,280

In a first phase a gas mixture with excess H<sub>2</sub> is used over a catalyst consisting of Pd on large pore size Al<sub>2</sub>O<sub>3</sub> while in a second phase hydrogenation is catalysed by Pd on active Al<sub>2</sub>O<sub>3</sub>.

### Catalyst

UNIVERSAL OIL PRODUCTS CO.  
*Dutch Application* 254,008

Long life Friedel-Crafts catalyst consists of a known metal halide deposited on an inorganic oxide support impregnated with a lower valency Pt metal, e.g. Pd reduced with H<sub>2</sub>.

### Production of 2-Ethyl-pyridine

V.E.B. LEUNA-WERKE "WALTER ULBRICHT"  
*Dutch Application* 262,794

Pyridine-2-ethanol is reduced to 2-ethyl-pyridine by H<sub>2</sub> in the presence of a Ni/Al<sub>2</sub>O<sub>3</sub> base impregnated with a Pd or Pt oxide catalyst.

## FUEL CELLS

### Improved Fuel Cell Systems

THE ELECTRIC STORAGE BATTERY CO.  
*British Patent* 970,420

In an improved fuel cell system, both the electrodes are porous conductive bodies and Ag is used as catalyst for the O<sub>2</sub> electrode and Pd or Pt group metals act as catalysts for the H<sub>2</sub> electrode.

### Improved Fuel Cells

SHELL RESEARCH LTD. *British Patent* 971,454  
Electricity is generated in fuel cells which have a circular O<sub>2</sub> electrode consisting of microporous PVC on which a  $\mu$  Ag layer and 5 mg/On<sup>2</sup> Pd black have been deposited and a central fuel electrode of exactly the same type to which a fuel comprising a mixture of 1–4 C monohydric alcohol and formaldehyde, formaldehyde polymer or HCOOH is supplied.

### Precious Metal Hydrogen Diffusion Electrodes

LEESONA CORP. *U.S. Patent* 3,148,089  
Fuel cells utilise fuel electrodes in the form of

H<sub>2</sub> diffusion tubes constructed of Pd or Pd/Ag alloys containing 5–40 wt. % Ag.

### Fuel Cell Electrode

LEESONA CORP. *French Patent* 1,354,465  
Electrodes for fuel cells are constructed of 0.025–1.27 mm thick foil of hydrophobic or hydrophilic polymer with 40–90% porosity which act as supports for catalytically active porous and conducting metal films, e.g. Pt, Pd, Rh, Ru.

### Precious Metals in the Production of Fuel Cell Electrodes

LEESONA CORP. *French Patent* 1,354,685  
An electrode suitable for a fuel cell and non-porous to H<sub>2</sub> diffusion is made of a 5–40% Ag and 95–60% Pd alloy and one of its faces is coated with Pd black. This electrode is used advantageously as an anode in conjunction with a Ni cathode activated by Co or Ni and the Pd black face is turned towards the combustible gas used in the fuel cell.

### Palladium and its Alloys in the Manufacture of Hydrogen Electrodes

ELECTRICITE DE FRANCE *French Patent* 1,359,656  
The electrode membrane of H<sub>2</sub> combustion electric cells, operated at 200–800°C, and having fused salts or oxides as electrolyte, is formed by Pd or its alloys and may be made more rigid by a special framework.

### Platinised Electrodes for Fuel Cells

AMERICAN CYANAMID CO.  
*French Patent* 1,361,225

Electrodes for fuel cells consist of C into which has been incorporated 0.1–40 wt. % Pt and on which 0.1–10 wt. % Pt group metal, preferably Pt, has been electrodeposited.

## GLASS TECHNOLOGY

### Apparatus for Spinning Molten Glass

DEEGLAS FIBRES LTD. *British Patent* 969,905  
The apparatus comprises a casing of Rh or Pt in which is a chamber for molten glass and at its bottom a number of tubes leading to spinning nozzles, the tubes being heat-insulated.

## TEMPERATURE MEASUREMENT

### Resistance Thermometers

DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT  
*British Patent* 973,256

In a resistance thermometer, the temperature-sensitive measuring wire consists of a base metal, e.g. Ni, which is coated with a thin layer of 30–70 wt. % Ag/70–30 wt. % Pd alloy.