

e.m.f. is only 0.5 V from the reversible H₂ potential in the same electrolyte. The almost complete electro-oxidation of CH₄ means that further study of saturated hydrocarbons and their relation to electro-oxidation is necessary.

Investigation of Current Transport between a Catalyst Suspension Fuel Charge and Brush Electrodes

J. HELD and H. GERISCHER, *Ber. Bunsengesell. Phys. Chem.*, 1963, **67**, (9/10), 921-929

A fine catalyst slurry of Pt or Pd black, or Raney Ni, was suspended in the electrolyte (1 N NaOH was tested in each case and 2 N H₂SO₄ with Pt or Pd black). H₂, CH₃OH and CH₃COOH fuels were oxidised by O₂ bubbled into the cell and current was collected at Pt or Pd electrodes. Current density depended on catalyst and fuel concentrations, on electrode material, on stirring, and on temperature.

Physical Chemistry and Construction of Fuel Cells. I. Physicochemical Problems of the Fuel Cell

G. FEUILLADE, *La Technique Moderne*, 1963, **55**, (12), 600-608

Basic principles of the fuel cell, its thermodynamics and kinetics are described. Metals with catalytic activity are used as electrodes. At lower temperatures these are principally Pt, Pd and

Rh-Pt alloys at the H₂ electrode, and Au, Pt, Pd and Ag at the O₂ electrode. Above 400°C the order of catalytic activity at the H₂ electrode is Co < Pt < Au < 10% Ir-Pt < Cu < Pd < 10% Rh-Pt < Ag < Ni and at the O₂ electrode is Au < 10% Ir-Pt < Pt < Co < Cu < 10% Rh-Pt < Ag < C < Ni < Pd, but in the latter group only Au, Cu, Pd and Pt and its alloys have an oxidation potential greater than that of O₂ and are therefore corrosion-resistant.

TEMPERATURE MEASUREMENT

Thermocouples for Prolonged and Deep Temperature Measurement of Liquid Steel in Moulds

M. RÉDR, Z. KOŽUŠNÍK and B. LONSKÝ, *Hutnické Listy*, 1963, **18**, (7), 465-471 (in Czech)

Metal-clad thermocouples are more robust than those protected only by a ceramic covering. They are cheaper and their start-up time is short. Diagrams illustrate Pt:10% Rh-Pt and 6% Rh-Pt:30% Rh-Pt assemblies used in tests on the properties of protected thermocouples. They worked well for 13 hours while immersed 76 cm into liquid steel in a 10 ton ingot and were then switched off. Possible direct immersion of a metal-ceramic clad thermocouple of simple design is considered.

NEW PATENTS

Electrodeposition of Ruthenium

INTERNATIONAL NICKEL CO. (MOND) LTD.
British Patent 938,164

Provides a process whereby Ru is electro-deposited from an aqueous acidic solution of a soluble tetra sulphamato nitrosyl ruthenate. The Na salt is used preferably which the solution should contain to the extent of 2.5 to 20 g/l.

Production of Carbonyl Compounds

FARBWERKE HOECHST A. G.
British Patents 938,831-938,838

A series of patents relating to a process for the production of aldehydes, ketones, and/or acids which comprises reacting an olefine with O₂ and H₂O in a neutral or acid medium and in the presence of a Pt group metal and a redox system.

Catalytic Hydrogenation of Methyl-butynol

LABORATORI RIUNITI STUDI E RICERCA S.P.A.
British Patent 938,849

Method for the production of 2-methyl-3-buten-2-ol comprises catalytically hydrogenating 2-methyl-3-butyne-2-ol at 40°C in the presence of a metallic Pd/BaSO₄ catalyst.

Production of Aliphatic or Cyclo-aliphatic Carboxylic Compounds

SHELL INTERNATIONAL RESEARCH N.V.
British Patent 938,854

Process for the production of the above-mentioned compounds comprises passing the corresponding aliphatic or cyclo-aliphatic primary or secondary alcohol in the gaseous state through two heated zones containing a Pt group metal dehydrogenation catalyst.

Catalytic Hydrogenation of Pyridine Compounds

ABBOTT LABORATORIES. *British Patent* 938,909
Relates to the catalytic reduction of pyridine or C-substituted derivatives to piperidine or corresponding derivatives thereof using a Ru catalyst, preferably in an amount of from 0.5% to 2.0% by wt. based on the pyridine.

Removal of HCN from Gases

ENGELHARD INDUSTRIES INC.
British Patent 939,254
HCN-containing gas is passed over a Pd, Pt, Rh or Ru catalyst. The catalyst metal, which is pre-

ferably in a very finely divided form, may be supported on alumina, silica, or diatomaceous earth.

Process for the Production of 3-Halo-imino-dibenzyls

J. R. GEIGY A. G. *British Patent* 939,270

Relates to a novel process for the preparation of 3-halo-imino-dibenzyls which involves the use of a Pd catalyst.

Production of Phenol

SCIENTIFIC DESIGN COMPANY INC.

British Patent 939,613

A Pt/C catalyst is used in a process for the production of phenol from cyclohexane. The cyclohexane is first oxidised to a mixture of cyclohexanone and cyclohexanol, and the alcohol/ketone mixture is subsequently dehydrogenated using a Pt catalyst.

Preparation of Supported Catalysts

E. I. DU PONT DE NEMOURS & CO.

British Patent 940,666

A method for the preparation of catalysts for use in fume-abatement processes comprises impregnating a support material having a pore-size within a stated range with an aqueous solution of an ionisable salt of at least one of the metals Pt, Rh, Pd, Ru, Ir or Ag.

Hydrocarbon Combined Reforming De-alkylation Process

UNIVERSAL OIL PRODUCTS CO.

British Patent 940,667

Relates to a combination catalytic reforming process, which involves the use of a catalyst having a Pt group metal component.

Catalyst for Oxidative Dehydrogenation

SHELL INTERNATIONAL RESEARCH

British Patent 940,710

Catalyst comprises Au, and at least one of the Pt group metals, as well as a solid refractory oxide support having a surface area less than 8 m²/g.

Penicillins

BEECHAM RESEARCH LABORATORIES LTD.

British Patent 940,712

A process for preparing α -hydroxyalkyl and α -hydroxyaralkyl penicillins involves the use of a Pd/BaCO₃ catalyst.

Polymerisation of 1,3-Butadiene

MONTECATINI SOCIETA GENERALE

British Patent 941,365

A process for the preparation of crystalline polymers of 1,3-butadiene having a substantially syndiodactic-1,2 structure comprises contacting the butadiene with a catalyst formed from a halogen free salt of a Group VIII metal, e.g. Pt or Pd, and Al tri-alkyl.

Production of Carbonyl Compounds

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 941,951

An olefinic hydrocarbon in which at least one H atom is attached to one of the doubly bonded C atoms, is directly oxidised to an aldehyde or ketone by contacting the olefine with H₂O₂ in the presence of a salt of a Pt group metal and of an aqueous mineral acid.

Recovery of Rhodium from Fission Products

ENGELHARD INDUSTRIES INC.

British Patents 941,985-941,986

Each relates to a process for the recovery of Rh from the waste streams of hot U reprocessing plants.

Treatment of Hydrocarbon Fractions

THE BRITISH PETROLEUM CO. LTD. *et al.*

British Patent 943,238

A Pt group metal-alumina catalyst containing at least 1 wt.% of halogen is used in the treatment of a petroleum fraction. Pt or Pd and F₂ are used.

Treatment of Hydrocarbon Fractions

THE BRITISH PETROLEUM CO. LTD.

British Patent 943,239

A Pt group metal-refractory oxide catalyst is used in a process for treatment of hydrocarbon fractions boiling above 150°C.

Brazing Alloy

GENERAL ELECTRIC CO. (NEW YORK)

British Patent 943,390

A Ni base brazing alloy comprises 3-8 wt.% Cr, 3-8 wt.% Pd, 16-25 wt.% Ge, 4-22 wt.% Cu and balance Ni. Brazing temperature 1950°F; oxidation resistance 1550°F, and good flow characteristics and wettability.

Catalytic Treatment of Hydrocarbon Distillates

UNIVERSAL OIL PRODUCTS CO.

British Patent 944,213

A Pt group metal (0.01-5% by wt.) on a non-siliceous carrier is used in the catalytic treatment of hydrocarbon distillates.

Separation of Hydrogen from Gas Mixtures

UNIVERSAL OIL PRODUCTS CO.

British Patent 944,333

A diffusion cell embodies a porous solid matrix of sintered metal particles on opposite exterior sides of which are diffusion membranes of Pd or a Pd alloy, so that the gas pressure on one membrane tends to cancel out that exerted on the membrane on the other side of the matrix.

Oxidation of Olefins

FARBWERKE HOECHST A. G. *British Patent* 944,382

Refers to the use of a Pt group metal, preferably

Pd, catalyst in the oxidation of olefines to carbonyl compounds of like number of carbon atoms.

Cathodic Protection Systems

ENGELHARD INDUSTRIES INC.
British Patent 944,715

A cathodic protection system includes an anode comprising a current discharging surface of Pt, Rh or an alloy of 50% Pt and/or Rh and another Pt group metal bonded in metal-to-metal contact with a mass of Ti or an alloy of at least 90% Ti.

Electrolytic Production of Chlorine

FARBWERKE HOECHST A. G. *British Patent 945,712*
An anode for production of Cl₂ by electrolysis of an alkali metal chloride or HCl is formed of Ir- or Ir alloy-coated Ti.

Fuel Cell Electrode

THE ELECTRIC STORAGE BATTERY CO.
British Patent 946,308

A fuel cell electrode is made by intimately mixing under heat and pressure, 1 part by wt. of a thermoplastic resin, 1/2-3 parts by wt. of polyethylene oxide, a powdered electrode material of Ag, Ni, a mixture of Ag and Ni, Cu or graphite, and Pd oxide to form a plasticised mass. The resin is insoluble in water and alkaline electrolytes incompatible with the polyethylene oxide and insoluble in fuel cell electrodes. The mass is formed as an electrode and the Pd oxide converted to Pd in an alkaline electrolyte.

Fuel Cells

ESSO RESEARCH & ENGINEERING CO.
British Patent 946,367

The cathode and/or anode of a fuel cell is/are formed of a mixed metal catalyst containing a major amount of Pt and at least 0.003 wt.% of Ir, constituting 1-10 wt.% of the catalyst.

Manufacture of 2-β-Methoxy-ethyl Pyridine

IMPERIAL CHEMICAL INDUSTRIES LTD.
British Patent 946,880

2-β-methoxy-ethyl pyridine is made by reduction of 2-β-methoxy-ethyl pyridine-N-oxide by means of hydrogen in the presence of a Raney Ni, Pd, Pt or Pt oxide catalyst.

Preparation of 4-Amino-diphenyl Amine

IMPERIAL CHEMICAL INDUSTRIES LTD.
British Patent 947,082

A Pd, Pt or Ru catalyst is used in a process for the preparation of the above compound.

Production of Cyclohexane Carboxylic Acid

ALLIED CHEMICAL CORP. *British Patent 947,264*
Cyclohexane carboxylic acid is made by reacting molten benzoic acid with H₂ in the presence of a supported Pd, Rh or Ru catalyst. Pd/C specifically claimed.

Paraffin Hydroisomerisation

GULF RESEARCH & DEVELOPMENT CO.
U.S. Patent 3,105,859

Isomerisation of paraffins over supported Pt catalysts in the presence of halogen gives better yields when excess addition of halogen is avoided and a metered addition of a volatile halogen source is made to the reactants.

Olefine Oxidation Catalyst

FARBWERKE HOECHST A. G. *Patent 3,106,579*
Olefines are oxidised to aldehydes or ketones over a supported solid catalyst containing (a) a Pd, Ir, Ru, Rh or Pt salt and (b) an inorganic salt of a polyvalent metal able to form a redox system, e.g. PdCl₂ with CuCl₂. A plurality of contact zones is used to produce exothermic oxidation in stages.

Platinum in Cathodic Protection Electrodes

R. C. SABINS *U.S. Patent 3,108,939*
Where impressed currents are used to protect articles against corrosion, e.g. in seawater, the activity of the electrode, which is made of Pb or a similar metal, is increased by introducing into the electrode mass a small mass of Pt.

Hydrocarbon Conversion Catalyst

SOCONY MOBIL OIL CO. *U.S. Patent 3,108,945*
Catalyst giving high yields of petrols from heavier hydrocarbons consists of an acidic cracking component of at least two refractory oxides of Group IIA, IIB, IVA and IVB metals and between 0.05 and 10 wt.% of a Pt catalyst to give an activity index of at least 25.

Alkylation of Aromatic Compounds

PHILLIPS PETROLEUM CO. *U.S. Patent 3,109,038*
An alkyl group is added to an aromatic compound by reacting the feedstock with ethane, propane or butane at 400-900°F, 0-5000 p.s.i.g. and a velocity of 0.1-10 over a catalyst consisting of supported Pd, Pt, Rh or Ir, preferably a Pt-fluoride-alumina catalyst.

Polyalkyl Benzene Production

E. I. DU PONT DE NEMOURS & CO.
U.S. Patent 3,110,742
Dialkyl to tetralkyl benzenes are produced by reacting an alkyl benzyl halide with hydrogen in the presence of a noble metal hydrogenation catalyst, e.g. Pd on charcoal.

Catalytically Active Coatings on Reaction Chamber Walls

LONZA LTD. *U.S. Patent 3,112,215*
The walls of reaction chambers for the synthesis of HCN₄ from NH₃ and CH₄ at 900°-1400°C are coated with catalyst by impregnating them with a solution of an Al and a Pt metal salt and then heating in a reducing gas to produce Al oxide and a Pt metal, e.g. a mixture of Pt and Ru.

Catalyst for Carbonyl Production

CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE G.m.b.H. *Dutch Application* 223,659

The oxidation of alkenes to produce carbonyl compounds is catalysed by compounds having ions of Pt metals associated with anions of strong mineral acids whose dissociation constant is at least 10^{-3} , e.g. a catalytic mixture of Ir chloride and ferric chloride deposited on charcoal.

Catalytic Production of Carbonyl Compounds

CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE G.m.b.H. *Dutch Application* 231,164

Unsaturated compounds containing one or more O, S, halogen, N and/or Si atoms are oxidised to carbonyl compounds at 0–250°C by reaction with acid or neutral solutions of Pt metal compounds in water, e.g. Pd or Rh chloride.

Palladium Decorative Compositions

ENGELHARD INDUSTRIES INC.

French Patent 1,328,321

Decorative compositions, particularly intended for ceramic decoration, are based on a coordination compound in an organic vehicle in a suitable solvent such as toluene. A typical complex is bis-di-N-butylsulphido-palladous chloride. The Pd may be accompanied by Rh and Ir in small amounts and may be used with organic Au compounds of the known type in decoration.

Platinum-lined Plant and Equipment

COMPTOIR LYON-ALEMAND, LOUYOT & CIE.

French Patent 1,328,512

Apparatus and pieces of equipment which come into contact with molten materials at high temperatures, e.g. glass, are protected by a composite material consisting of a layer of pure Pt which comes into contact with the molten material bonded to a layer of Pt-Rh alloy. There may be an intermediate layer of a Pt alloy with Ir, Ru, etc., to stop penetration of corrosive elements.

Hydrogenation of Polyacetylenes

DIAMOND ALKALI CO. *French Patent* 1,328,588

Long chain aliphatic compounds and large ring alicyclic compounds are produced by the hydrogenation of the corresponding polyacetylene compounds over catalysts of Pd, Pt or their oxides.

Precious Metal Brazing Alloys

INTERNATIONAL NICKEL CO. (MOND) LTD.

French Patent 1,331,155

Brazing alloys for refractory metals consist of Cu, Pd and Au within a range defined by 28–87.5% Au, 12–52% Cu and 0.5–20% Pd.

Selective Hydrocracking and Reforming

ESSO RESEARCH & ENGINEERING CO.

French Patent 1,331,329

A new catalyst with high selective activity for hydrocarbons with 5 or more carbon atoms con-

sists of a carrier impregnated with a noble metal (preferably alumina with 0.1–2 wt.% Pt) but free from common metals in the pores and having a superficial surface deposit of a common metal, preferably Fe in ferromagnetic form.

Chemical Platinum Metal Deposition

AMALGAMATED CURACAO PATENTS CO. N. V.

French Patent 1,332,798

Metallic, non-metallic, ceramic and glass supports are coated with Ir, Rh, Pt or another precious metal at lower temperatures than used at present by using solutions of precious metal compounds, a known reducing agent and an atmosphere of an alkaline gas, e.g. a mixture of NH_3 and reducing gas.

Catalyst for Car After-burners

W. R. GRACE & CO. *French Patent* 1,333,081

New combustion catalyst is produced by first preparing a catalyst concentrate composed of 0.1–5% Pt on a silica-alumina, silica-zirconia, silica-magnesia or alumina support and then diluting this concentrate to a Pt content of 0.001–0.5% with alumina, silica, alumina-boria, alumina-titania, etc.

Catalytic Deparaffination of Distillates

UNIVERSAL OIL PRODUCTS CO.

French Patent 1,333,244

New process for increasing the naphthene: paraffin ratio in distillates uses catalytic reaction with a catalyst comprising 0.01–5% Pt metal on a non-siliceous support.

Permeability of Metals to Hydrogen

A. KUSSNER AND E. WICKE *German Patent* 1,154,443

The permeability of Pd, Pd alloys (e.g. with Ag) and other metals to hydrogen is increased by contacting them with U or Ti hydride or providing articles made of the required metal with a coating of Ti or U hydride. The improved metal or alloy may be used in isotope separation or fuel cells, etc.

Aldehyde and Ketone Catalytic Production Process

ENGELHARD INDUSTRIES INC.

German Patent 1,155,429

Primary or secondary alcohols are dehydrogenated to aldehydes or ketones with a Pt or Ru catalyst on C using 0.10–100 Kg/h of alcohol per Kg catalyst at a pressure of 0.01–2 atom gauge and a temperature of 250–400°C.

Continuous Aldehyde and Ketone Production

CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE G.m.b.H. *German Patent* 1,158,049

Compounds containing one or more double bonds are oxidised to aldehydes and ketones using aqueous solutions of Pt metals and these solutions are regenerated by using an insufficiency of HNO_3 but excess O_2 at an elevated pressure.