

FUEL CELLS

Fuel Cell Uses Methanol. Methanol is Source of Hydrogen for Hydrogen-Oxygen Fuel Cell that Generates 5 kw Electricity

Chem. Eng. News, 1964, 42, (52), 31

The Shell Research Ltd fuel cell generates up to 5 kw at 60°C by converting CH_3OH to H_2 and reacting the latter with air. The H_2 is purified by diffusion through Ag-Pd alloy. Electrodes are microporous PVC sheets with a Ag layer over which is a Pt metal catalyst layer. Each electrode is 85% porous and about 1.3 ft², 0.03 in. thick. The electrolyte is alkaline, 62 cells in each of two batteries form a truck-mounted unit.

Fuel Cells. I. Propane on Palladium Catalyst. II. Propane and Propylene on Adams' Platinum Catalyst. III. The Propylene Potential in Low Temperature Cells

M. FUKADA, C. L. RULFS and P. J. ELVING, *Electrochim. Acta*, 1964, 9, (12), 1551-1562, 1563-1580, 1581-1586

Low temperature cells using gaseous hydrocarbons as fuels were studied. First, negative electrode catalysts of Pd, reduced by C_3H_8 at H_2 , supported on porous discs of Ni or C, in many cases waterproofed, were tested using gaseous C_3H_8 fuel, 30% KOH electrolyte, carbon-black air electrode, at 50°C. Repeated small current

discharges gave steady high open-circuit potentials and electrodes with fairly good discharge rates. Fifteen discs of Adams' catalyst pressed with Ag powder were tested at 80°C in He , C_3H_8 , C_3H_6 , and H_2 . The effect of the period of electrode reduction on the potential with C_3H_6 was studied. Finally, from the reproducible C_3H_6 potential at the Pt catalyst in 30% KOH, at 25°C a potential of 0.465 V (NHE) was calculated compared to 0.838V for the $\text{C}_3\text{H}_6\text{-O}_2$ cell. Possible reaction mechanisms in C_3H_6 cells are discussed.

ANODIC PROTECTION

Anodic Protection of Stainless Steel by Galvanic Coupling with Platinum

G. BIANCHI, A. BAROSI and S. TRASATTI, *Electrochim. Acta*, 1965, 10, (1), 83-95

Stainless steel in H_2SO_4 is passivated and does not corrode when coupled galvanically to Pt sheet with areas in suitable ratio; e.g. $R=1$ with 38% H_2SO_4 at room temperature; $R=100$ with 52% H_2SO_4 at 75°C. Tests with Pt, Pd and Au show that the efficiency of Pt for anodic protection of stainless steel is due to its dual effect on passivation, not shared by Pd and Au. Stainless steel first enters the zone of unstable passivity, since over-voltage of Pt for discharge of H^+ is low; then it enters the zone of stable passivity, since O_2 in solution is reduced more easily on Pt than on stainless steel.

NEW PATENTS

METALS AND ALLOYS

Spring Elements

THE INTERNATIONAL NICKEL CO. (MOND) LTD.
British Patent 974,057

A spring for use at 500°C or above consists of an Ir alloy containing 0.5-7 wt.% W and incidental impurities.

Commutator Devices for Micromotors

HITACHI LTD. *British Patent* 975,299
A commutator device for micromotors has commutator segments made of 80-60 wt.% Ag and 20-40 wt.% Pd alloy and holders carrying in sliding contact with the segments metallic brushes made of 95-70 wt.% Pt and 5-30 wt.% Ir alloy.

Improving the Ductility of Ruthenium

THE INTERNATIONAL NICKEL CO. (MOND) LTD.
British Patent 981,535

The workability of Ru is improved by melting it under neutral conditions in contact with 0.05-5 wt.% of one or more of the elements: Zn, Cd, Bi, Ti, Ge, Ba, Hf, Ce, Er, Ga, Ho, La, Pr, Sm, Y or Yb and allowing it to solidify without changing the conditions.

Precious Metals and Alloys

THE INTERNATIONAL NICKEL CO. (MOND) LTD.
British Patent 981,792

A sheet or strip of Pt group metals or their alloys is produced by forming a compact of flake powder with or without alloying ingredients, heating so that sintering occurs and working the sintered metal to give the desired sheet or strip.

Electrical Resistors

INTERNATIONAL RESISTANCE CO.
U.S. Patent 3,154,503

An electrical resistor is produced by applying to a ceramic substrate and firing a vitreous enamel consisting of 99-50 wt.% glass frit including 1-24 wt.% Ag_2O and 1-50 wt.% finely divided Pd, Pt or Rh.

Coating Glass or Refractory Oxides

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT
French Patent 1,366,570

The thermal resistance of refractory metal oxide bodies or mixtures of silicates is improved and their corrosion by other materials is prevented by coating them with a Pt alloy containing 2-10 wt.% Rh and 0.5-10 wt.% Pd.

Spinnerets

DEUTSCHE GOLD- & SILBER-SCHNEIDANSTALT

German Patent 1,181,922

Longer spinneret life is achieved using alloys containing 25-40% Rh and the remainder Pt.

ELECTROCHEMISTRY

Coated Titanium Electrodes

CANADIAN INDUSTRIES LTD. *British Patent* 974,320

An electrode particularly suitable as an anode in the electrolysis of brine consists of a Ti core with a 10-200 μ thick electrodeposited layer of an alloy of 35-60 wt. % Rh and 65-40 wt. % Pt.

Activated Platinum-plated Titanium Anode

UNIVERSAL OIL PRODUCTS CO.

British Patent 974,570

An anode suitable for the electrolysis of an alkaline chloride solution is prepared by electroplating a Ti member from H_2PtCl_6 solution at 71-77°C to give an adherent amorphous coating of Pt which is then activated by heating above 316°C in the presence of an air stream containing hydrocarbon vapours, whereby catalytic oxidation of the vapours occurs over the entire surface of the Pt coating.

Production of Super-pure Hydrogen

NIPPON JUNSINZO K.K. *U.S. Patent* 3,155,467

Super-pure H_2 is obtained by passing a gaseous H_2 mixture at 500-600°C through a permeable wall of a Pd alloy containing 2-40 wt. % of at least one Group I B metal and 0.1-20 wt. % of at least one Group VIII metal other than Pd, e.g. Ag-Ru-Pd or Au-Pt-Pd.

Activation of Platinum Group Metals

JOHNSON, MATTHEY & CO. LTD.

French Patent 1,364,203

The Pt group metals, and in particular various electrodes coated with such metals, are activated by contacting them with an alkali metal amalgam, distilling off Hg at 260-482°C and recrystallising the Pt or Pt-Rh alloy film at 371-537°C.

Hydrogen Diffusion Tubes

CHEMETRON CORP. *French Patent* 1,367,110

An improved apparatus for the production of extremely pure H_2 uses an arrangement of 75 μ thick Pd diffusion tubes.

ELECTRODEPOSITION

Electrolytic Palladium Plating

INTERNATIONAL BUSINESS MACHINES CORP.

U.S. Patent 3,150,065

Non-porous Pd deposits suitable for use as electrical contacts for printed circuit cards are obtained by using a Pt anode and connecting the

substrate as a cathode in a diaphragmless bath solution containing 60 g/l palladosamine chloride, 10 g/l Na_4Cl , 25 g/l $(NH_2)_2SO_4$ and 50 ml/l NH_2OH .

Palladium or Platinum Plating Bath

JOHNSON, MATTHEY & CO LTD.

German Patent 1,182,924

Bath contains an aqueous solution of a complex dinitritoplatinate (II) or dinitritopalladate (II).

Platinum Electrodeposition

THE INTERNATIONAL NICKEL CO. (MOND) LTD.

Dutch Application 212,633

Electrodeposition takes place using an aqueous chloroplatinate solution containing 10-50 g Pt and 180-300 g HCl at 45-90°C using plating conditions laid down in a diagram.

Platinum Plating Baths

ASAHI KASEI K.K.K. *Dutch Application* 64.02,931

An electroplating bath consists of NH_4 , K or Na sulphamate dissolved in an aqueous solution of dinitrodiaminoplatinic acid. High gloss coatings can be obtained.

Chemical Deposition of Pd

THE INTERNATIONAL NICKEL CO. (MOND) LTD.

Dutch Application 64.03,078

Pd is deposited in adherent layers on surfaces by chemical plating from a bath containing Pd (II), an unsymmetrical dimethyl hydrazine and NH_3 and/or one or more aliphatic triamines.

BRAZING

Brazing Alloys

THE INTERNATIONAL NICKEL CO. (MOND) LTD.

British Patent 976,660

A brazing alloy for the production of ceramic-to-ceramic and ceramic-to-metal joints consists of 30-75 wt. % Pd, 2-9 wt. % Ti and the remainder, except for impurities, Ni, preferably taken in a 3:2 Pd:Ni ratio.

Brazing Alloys

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

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.

CATALYSIS

Removal of Alkynes from Hydrocarbon Mixtures

SHELL INTERNATIONALE RESEARCH MIJ. N.V.

British Patent 974,038

Alkynes are removed from a hydrocarbon mixture containing alkadienes by passing a solution of H_2 dissolved in such a mixture together with gaseous H_2 in an upflow stream through a fixed bed con-

sisting of a macroporous support carrying 0.1–5 wt. % Pd catalyst.

Platinum and Palladium Oxide Catalysts in the Production of 2-Ethyl-pyridine

VEB LEUNA-WERKE "WALTER ULBRICHT"

British Patent 974,113

2-Ethyl-pyridine is produced by heating 2-(β -hydroxyethyl)-pyridine to 250–400°C in an H₂ atmosphere and in the presence of a catalyst consisting of Al₂O₃ and Pd or Pt oxide.

Platinum Group Metal Phosphatide Hydrogenation Catalysts

CENTRAL SOYA CO. INC. *British Patent* 974,432

Phosphatide material is hydrogenated by contacting Pd, Pt, Rh or their mixtures supported on C, Al₂O₃, CaCO₃ or diatomaceous earth with H₂ and then contacting 0.05–1.0 wt. % of the hydrogenated catalyst with the phosphatide and H₂.

Production of Sulphonamides

CIBA LTD.

British Patent 974,983

A Pd/C hydrogenation catalyst is used in the production of 1,4-endoalkylene-cyclohexane-2-sulphonamides by the reaction of sulphonyls with NH₃ or amine followed by hydrogenation and if desired also N-alkylation or N-acylation.

Derivatives of 1-Phenyl-2-aminoethanol

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 975,291

The production of 1-phenyl-2-aminoethanol derivatives involves a hydrogenation stage in the presence of Pt or Pd/C catalyst.

Production of Carboxylic Acid Esters

IMPERIAL CHEMICAL INDUSTRIES LTD

British Patent 975,709

Carboxylic acid esters of unsaturated monohydric alcohols are produced by contacting an olefine with a Pd salt, a carboxylate, which is ionised under the reaction conditions, and a redox system in a carboxylic acid.

Production of Cyclohexanone

ALLIED CHEMICAL CORP. *British Patent* 976,339

Cyclohexanone is produced by the hydrogenation of phenol at 150–225°C, 2.46–10.5 kg/cm² and in the presence of 5% Pd/C catalyst promoted with 1000–7000 p.p.m. of combined Na based on wt. of catalyst and 1–10 p.p.m. of phenol of an inorganic sodium compound.

Production of Aromatic Halogen-containing Compounds

MONSANTO CHEMICALS LTD.

British Patent 976,438

Halogen-substituted aromatic compounds are produced by subjecting an aromatic sulphonyl halide to thermal decomposition at 300–400°C

and in the presence of Pd or Pt or an oxide or halide thereof as a catalyst.

Process for Preparing Esters

NATIONAL DISTILLERS & CHEMICAL CORP.

British Patent 976,613

Ethylenically unsaturated esters are produced by reacting an alkene in the vapour phase with a carboxylic organic acid and an O₂-containing gas in the presence of a catalyst comprising a Group VIII noble metal and/or its salt or oxide, e.g. Pd/C or PdX₂, where X is halogen, or RhCl₃.

Platinum Group Metal Catalysts

SOCONY MOBIL OIL CO. INC.

British Patent 978,261

Pt group metal catalysts are produced by introducing an appropriate metal into a crystalline aluminosilicate zeolite, or into a reaction mixture for preparing such a zeolite, so that the metal is distributed on or within the crystalline structure of the zeolite, followed by thermal treatment at 250–1100°F so that the Pt group metal is catalytically activated.

Production of Cyclododecanone Oxime and its Hydrochloride

BADISCHE ANILIN- & SODA-FABRIK A.G.

British Patent 978,497

The hydrogenation of 2-chlorocyclododecanone-(1)-oxime or a corresponding compound containing one or two olefinic bonds, if carried out at 0–130°C in an inert solvent and in the presence of dispersed, supported Pd or Pt catalyst, yields cyclododecanone oxime HCl.

Hydrocracking Process

UNIVERSAL OIL PRODUCTS CO.

British Patent 978,613

Hydrocarbon oils are hydrocracked at 288–454°C and 75–136 atm H₂ pressure in the presence of a catalyst containing 0.01–3.0 wt. % Pd or other Pt group metal on a precalcined base consisting of 37–88 wt. % SiO₂ and 63–12 wt. % Al₂O₃.

Alpha-acetoxypropionaldehyde

AJINOMOTO CO. INC.

British Patent 980,239

The reaction between liquid vinyl acetate and H₂ and CO at 30–180°C and above 50 kg/cm² pressure, if carried out in an organic solvent and in the presence of 0.001–1.0 g/l Rh in the form of its carbonyl, or Rh-containing substance which is converted to carbonyl under the reaction conditions, results in the formation of α -acetoxypropionaldehyde.

Preparation of Dipyridyls

IMPERIAL CHEMICAL INDUSTRIES LTD.

British Patent 981,353

2,2'-Dipyridyls or their alkyl derivatives are produced by heating pyridine or its alkyl derivatives of 250–450°C in the presence of 1–50 wt. %

alumina catalyst supporting about 5 wt.% finely divided Rh, Os or Ir.

Hydrazine Derivatives

T. J. SMITH & NEPHEW LTD.

British Patent 981,460

N_2H_4 derivatives of formula $OHPH-CH_2-NR-NHR$ are produced by the hydrogen reduction of $OHPH-CH_2NR-NH_2$ in alcoholic solution in the presence of R_2CO and a PtO catalyst.

Hydrocarbon Conversion Catalysts

THE BRITISH PETROLEUM CO. LTD

British Patents 981,691-9

Hydrocarbon conversion catalysts useful as catalysts for isomerisation, the production of halogenated hydrocarbons and dehydrohalogenation comprise a refractory metal oxide supporting 0.01-5 wt.% Pt group metal, preferably Pt or Pd, 0.01-10 wt.% alkali or alkaline earth metal and 1.0-15 wt.% retained halogen, preferably Cl.

Platinum Catalyst for the Oxidation of Exhaust Gases

UNIVERSAL OIL PRODUCTS CO.

U.S. Patent 3,148,036

An exhaust gas converter uses as the oxidation catalyst Al_2O_3 spheres supporting 0.1 wt.% Pt.

Catalyst Structures

VARTA A.G. & SIEMENS-SCHUCKERTWERKE A.G.

U.S. Patent 3,150,011

Double skeleton catalyst structures are produced by applying a finely divided supporting skeleton material on a conductive substrate base, sintering at 600-1100°C, embedding a finely divided Raney alloy of Pt, Pd, Re, Ag, W, Mo or Ni activated by a Pt group metal, sintering the laminate and dissolving out the soluble component.

Isomerisation Catalyst

CITIES SERVICE RESEARCH & DEVELOPMENT CO.

U.S. Patent 3,150,073

A reforming and isomerisation process for hydrocarbons utilises 0.6 wt.% Pt/ Al_2O_3 catalyst, 0.5-5 moles H_2 /mole hydrocarbon and is operated at 600-950°F and 100-600 p.s.i.g.

Production of Cyclohexane

PHILLIPS PETROLEUM CO. *U.S. Patent* 3,150,195

Activated charcoal supporting 0.01-5 wt.% Pt is used as a dehydrocyclisation catalyst in the production of C_6H_{12} from a mixture of $n-C_6H_{14}$ and methylcyclopentane.

Dehydrogenation Catalyst

EDOGAWA K.K.K.K.

U.S. Patent 3,150,930

In the cyclic production of H_2O_2 , tetra-hydro-anthraquinone is dehydrogenated to the corresponding anthraquinone at 80-300°C, 1 atm, with an C_2H_4 or C_3H_6 or H_2 acceptor and Pd catalyst supported by Al_2O_3 , MgO_2 , etc.

Decolourisation of Phthalic Acids

RICHFIELD OIL CORPORATION.

U.S. Patent 3,151,154

Phthalic acids are decolourised by contacting their solutions in a polar solvent with Pt, Pd, Rh, but preferably PtO₂, catalyst and H_2 at 100-250°C and 50-2000 p.s.i. followed by acidification and recovery of crystalline acid.

Catalysts in the Preparation of Ketones

DIAMOND ALKALI CO.

U.S. Patent 3,151,167

The contacting of an epoxide with an alcohol solution of $[Rh(CO)_4]_2$ or $[Ir(CO)_4]_2$ causes a molecular rearrangement to $R-CO-CH_2R^1$.

Paraffin Conversion Catalysts

PHILLIPS PETROLEUM CO. *U.S. Patent* 3,151,180

6-20C aliphatic paraffins are converted to the corresponding olefines by contacting them with an $\alpha-Al_2O_3$ of 0.01-5 m²/g surface area supporting Pt, Pd or Rh, at 850-1050°F and at atmospheric to 100 p.s.i.g. pressure and with 0.5-10 moles H_2 per one mole hydrocarbon.

Catalysts

AIR PRODUCTS AND CHEMICALS INC.

U.S. Patent 3,152,092

A Pt/ Al_2O_3 hydrogenative gasoline reforming catalyst is produced by forming sorptive Al_2O_3 granules by the dehydration of bayerite, subjecting them to humidification and carbonation treatment, impregnating them with a Pt compound and heating at elevated temperature to provide a predominantly dry $\eta-Al_2O_3$ carrier with a minor amount of Pt-containing compound.

Hydrogenation Catalysts

PHILLIPS PETROLEUM CO. *U.S. Patent* 3,152,144

Sulpholones are hydrogenated to sulpholanes by adding H_2O_2 to the feed and hydrogenating in the presence of Al_2O_3 or diatomaceous earth supporting Pt, Pd or their mixtures as catalyst.

Hydrocracking Catalysts

SOCONY MOBIL OIL CO. INC.

U.S. Patent 3,152,980

Hydrocarbon charges containing at least 1 wt.% pyrenes are hydrocracked in two stages in the presence of 0.05-20 wt.% Pt or Pd series noble metal supported on a composite of solid refractory oxides.

Hydrogenation Catalysts

COMMERCIAL SOLVENTS CORP.

U.S. Patent 3,153,095

N_2 , N-Dialkylhydrazines are produced by contacting lower N, N-nitrosodialkylamines with 0.5-1.5 wt.% urea, biuret, etc., to prevent catalyst poisoning and then hydrogenating them in the presence of a refractory oxide- or C-supported Pt, Pd, Rh or Ir catalyst.

Arylnaphthene Production

STAMICARBON N.V. *U.S. Patent 3,153,678*

Aryl or alkaryl naphthenes are produced by treating an aromatic hydrocarbon or an alkyl-substituted aromatic hydrocarbon with H_2 below 100 atm and $250^\circ C$ in the presence of a heteropolyacid, e.g. phosphomolybdic acid and 0.1–35 wt. % Pt, Pd, Ir, Os, Rh or Ru supported on a refractory oxide, based on the wt. of such acid.

Production of Hydrogen Iodide

EL PASO NATURAL GAS PRODUCTS CO.

U.S. Patent 3,154,382

HI is produced by reacting H_2 and I_2 at $100-400^\circ C$ in the presence of a composite catalyst consisting of Al_2O_3 , 0.01–1.0 wt. % Pt and 0.1–8 wt. % halogen combined with Al_2O_3 .

Demetallisation of Heavy Petroleum Oils

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,154,480

Metallic impurities are removed from petroleum residues boiling at $900-1500^\circ F$ by contacting them with finely divided Pt/ Al_2O_3 catalyst, subjecting them at $200-600^\circ F$ to high energy ionising radiation followed by separation of the catalyst on which the metallic impurities have been adsorbed.

Production of 5-Aminofurans

THE NORWICH PHARMACAL CO.

U.S. Patent 3,154,543

Catalytic hydrogenation of a nitrofurane in the presence of a solvent comprising $CH_3COOC_2H_5$ and absolute C_2H_5OH in a 3:1 volume ratio and a catalyst consisting of charcoal supporting 5 wt. % Pd, if carried out at 2–3 atm, yields the corresponding 5-aminofurans.

Reduction Catalysts

IMPERIAL CHEMICAL INDUSTRIES LTD.

U.S. Patent 3,154,584

Diaminotoluenes are produced by reducing dinitrotoluenes with H_2 in the presence of 15–150 p.p.m. Pt or Pd catalyst and carrying out the reduction in H_2O/C_2H_5OH mixture at $110-140^\circ C$ and 1–10 atm.

Oxidation of Olefines

FARBWERKE HOECHST A.G. *U.S. Patent 3,154,586*

Olefines are converted to carbonyl compounds by contacting them at $50-160^\circ C$ and a pH of 0.5–6 with O_2 and a liquid catalyst system comprising H_2O , a Pt, Pd, Rh, Ru or Ir salt and a redox system containing a metal showing several valencies under these reaction conditions.

Reforming Catalysts

SOCONY MOBIL OIL CO. INC.

U.S. Patent 3,155,605

Naphtha fractions are reformed catalytically by fractionating them to concentrate substantially all

alkyl cyclopentones in the lower naphtha fraction and reforming this fraction in the usual conditions in the presence of a steamed Pt/ Al_2O_3 catalyst and 0.001–0.7 wt. % S.

Catalytic Igniters

GENERAL ELECTRIC CO., NEW YORK

U.S. Patent 3,156,094

A catalytic ignition system incorporated into turbojet thrust augmentors utilises a flow permeable Pt or Pt alloy disc and a metering disc dynamically loaded against the catalyst element.

Dehydrogenation Catalysts

SHELL OIL CO.

U.S. Patent 3,156,735

Olefinic hydrocarbons are oxidatively dehydrogenated by contacting them at $400-550^\circ C$, in admixture with O_2 with a catalyst comprising a low surface area solid support and 0.05–5 wt. % Au and Pt, Pd, Rh, Ru or Ir taken in a ratio of 0.2–25 atoms of Au per atom of the said noble metal.

Hydrocarbon Conversion Catalysts

CALIFORNIA RESEARCH CORP.

U.S. Patent 3,157,590

An improved isomerisation-cracking process for petroleum distillates utilises a Group VIII metal catalyst, preferably 0.1–1 wt. % Pt or PtO supported on an active $SiO_2-Al_2O_3$ support.

Production of Cyclohexanone Oxime

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 3,157,702

Cyclohexanone oxime is produced by hydrogenating nitrocyclohexane in the presence of a 5% Pd/ C_2H_2 black catalyst containing 1% of Mg promoter and Pb acetate in a 1:5 Pb:Pd ratio.

Isomerisation Catalysts

ESSO RESEARCH & ENGINEERING CO.

U.S. Patent 3,158,662

5–6 C paraffins are isomerised by contact with a supported Pt catalyst containing 0.3–0.6 wt. % Pt and 5–15 wt. % $AlCl_3$ at $200-400^\circ F$, $400-1500$ p.s.i. and in the presence of H_2

Hydrogenation Catalyst

ABBOTT LABORATORIES

U.S. Patent 3,159,639

The hydrogenation of pyridylcarboxylic and pyridylalkanoic acids at $0-100^\circ C$, 1–1000 atm and in the presence of 0.5–5 wt. % Rh/C or Rh/ Al_2O_3 catalyst will result in the formation of the corresponding piperidylcarboxylic and C-piperidylalkanoic acids.

Catalyst

GENERAL ELECTRIC CO.

U.S. Patent 3,159,662

The $(PtCl_2-C_2H_4)_2$ complex has been used as a catalyst in the production of organosilicon compounds by reacting aliphatically unsaturated compounds with those containing Si-H bonds.

Production of α -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_2 and Co in the presence of a Rh catalyst yields α -acyloxy-propionaldehydes.

Precious Metal Hydrogenation Catalysts

SHIONOGI & CO LTD *French Patent 1,361,980*

Unsaturated morphinanes may be hydrogenated with H_2 in the presence of Pt or Pd catalyst.

Glyoxal Production

BADISCHE ANILIN- & SODA-FABRIK A.G.

French Patent 1,363,089

Glyoxal is produced by reacting C_2H_4 at 0–100°C with 1–40 wt.% HNO_3 and in the presence of 0.0001–1 wt.% Pd salt, preferably $PdCl_2$ or $Pd(NO_3)_2$.

Hydrocracking Catalysts

SHELL INTERNATIONALE RESEARCH MIJ. N.V.

French Patent 1,364,001

A catalyst for the hydrocracking of hydrocarbon oils consists of a refractory oxide of 50–90 wt.% SiO_2 and 10–50 wt.% Al_2O_3 , part of which may be replaced by MgO_2 or B_2O_3 , carrying 0.1–20 wt.% Ag or Cu and 0.1–5 wt.% Pd, Rh, Ru or their mixtures.

Hydrogenation Catalysts

STE. D'ELECTRO-CHIMIE, D'ELECTRO-METALLURGIE ET DES ACIERES ELECTRIQUES D'UGINE

French Patent 1,364,577

Methylamines are produced by the gaseous phase hydrogenation of HCN with H_2 at elevated pressure, below 250°C and in the presence of a refractory metal oxide-supported Group VIII noble metal, preferably Pd or Pt.

Hydroforming Catalysts

IMPERIAL CHEMICAL INDUSTRIES LTD.

French Patent 1,365,520

Gaseous or liquid hydrocarbons are hydroformed at 550–750°C above 7 kg/cm² and in the presence of 1.3–5.5 moles H_2O , H_2 and 0.1–0.5 wt.% of a refractory oxide-supported Pt, Pd, Rh, Ru, Os or Ir catalyst.

Isomerisation Catalysts

THE BRITISH PETROLEUM CO. LTD.

French Patent 1,365,885

Ethylenic hydrocarbons are produced by the isomerisation of ethylenic hydrocarbon mixtures in the presence of a catalyst comprising a complex of a Pt, Pd, Rh, Ru or Ir halide and the ethylenic hydrocarbon, at elevated temperature and pressure.

Production of Organosilicon Compounds

COMPAGNIE FRANCAISE THOMSON-HOUSTON

French Patent 1,366,279

Organosilicon compounds are produced by

contacting an aliphatic compound with an Si compound having at least one Si-H bond in the presence of an Rh catalyst produced by reacting $RhCl_3 \cdot 3H_2O$ with compounds capable of giving an olefinic, carboxylate or substituted organoxy complex of Rh.

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.

Beta-chloroalkyl Chloroformate Production

BADISCHE ANILIN- & SODA-FABRIK A.G.

German Patent 1,179,922

The reaction of 1,2-alkylene oxides with phosgene in the vapour phase is catalysed by a Group VIII metal chloride on a support, e.g. $RhCl_3/Al_2O_3$.

Production of Vinyl Carboxylates

NIPPON GOSEI K.K.K.K. *German Patent 1,179,928*

The reaction of C_2H_4 , O_2 and carboxylic acid to produce vinyl acetate and higher homologues is catalysed by a mixture of a Pd, Rh or Pt salt and a Cu, Zn, Hg, Pb, Cr, Mn, Fe or Ni salt.

Removal of Formic Acid from 2-8C Fatty Acids

SHELL INTERNATIONALE RESEARCH MIJ.

German Patent 1,180,360

$HCOOH$ is removed from 2-8C saturated fatty acids by vapour phase degradation at 80–220°C using a catalyst consisting of 0.05–5 wt.% Pt/ Al_2O_3 with a neutral surface and a specific area of 20–400 m²/g.

Production of Adipodinitrile

E. I. DU PONT DE NEMOURS & CO.

German Patent 1,181,197

Adipodinitrile is produced by the hydrogenative scission of 1,2-dicyanocyclobutane in the presence of Pt or Rh catalyst.

Partial Diene Hydrogenation

BADISCHE ANILIN- & SODA-FABRIK A.G.

German Patent 1,181,700

Cyclic compounds with at least two double bonds are reduced to cyclo-olefines by molecular H in the presence of a Pd catalyst poisoned by Cu, Ag, Zn, Cd, Hg, Th, Pb, Sb, Fe, etc.

Catalyst

SOCONY MOBIL OIL CO. *German Patent 1,183,480*

Mixtures of various $Al_2O_3 \cdot 3H_2O$ are impregnated with a Pt compound to give 0.01–5 wt.% Pt in the final compound and HNO_3 and then dried and calcined.

Olefine Oxidation

FARBWERKE HOECHST A.G.

German Patent 1,183,488

The oxidation of olefines to aldehydes and/or ketones is catalysed by a Cu salt catalyst activated with a Pd salt with a Cu:Pd ratio of 50-500:1.

Reforming of Naphtha

ESSO RESEARCH & ENGINEERING CO.

Dutch Application 208,826

Pt/Al₂O₃ catalyst is used in treating high S, high boiling naphtha in a multiple zone reformation process.

Hydrogenation of Tetracycline Precursors

AMERICAN CYANAMID CO.

Dutch Application 226,460

A supported Pd catalyst is used in the production of tetracycline by catalytic hydrogenation.

η -Caprolactam Production

TEIJEN LTD.

Dutch Application 64.02,303

The caprolactam is produced from η -caprolactone, η -hydroxycapronamide or amides of η -hydroxycaproic acid by reaction with NH₃ in the presence of a hydrogenation catalyst, e.g. Pt/C or Pd/C. (See also No. 64.02,312).

Hydrogenation of Hydrocarbons

U.S. RUBBER CO.

Dutch Application 64.02,424

Organic compounds, such as heterocyclic compounds, are hydrogenated non-destructively using a Pt metal sulphide catalyst with H₂.

Reforming Catalyst

UNIVERSAL OIL PRODUCTS CO.

Dutch Application 64.03,228

A catalyst consists of a noble metal deposited on a refractory oxide, e.g. Pt/Al₂O₃, which has been modified with 0.05-1.5 wt. % S.

Selective Hydrogenation of Trienes

J. R. GEIGY A.G.

Dutch Application 64.04,143

Pd catalysts can be used for selective hydrogenation when they are used in the presence of a cyclic compound source of H.

Production of Organic Isocyanates

AMERICAN CYANAMID CO.

Dutch Application 64.10,490

Organic nitro compounds are reacted with CO in the presence of a noble metal catalyst, e.g. PdCl₂, to form organic isocyanates.

FUEL CELLS

Fuel Cells

LEESONA CORP.

British Patent 975,314

Electrodes for fuel cells are made by forming an

electrode structure by bonding a layer of zeolite to a ceramic structure or a zeolite layer of different pore size, ion-exchanging the naturally occurring ions of the zeolite for Pt, Pd, Rh ions and heating the composite at 600-1000°C to stabilise it.

Fuel Cells

ESSO RESEARCH AND ENGINEERING CO.

British Patent 976,796

A fuel cell suitable for use with liquid combustible fuels comprises an electrolyte container, an aqueous electrolyte and an electrode assembly consisting of Pt coated wire screen anode and cathode placed 0-001-1.0 mm away on each side of a 10-80% porous membrane with a 5-50Å pore.

Hydrogen Diffusion Electrodes

LEESONA CORP.

U.S. Patent 3,148,089

Fuel cells utilise fuel electrodes in the form of H diffusion tubes constructed of Pd or Pd/Ag alloys containing 5-40 wt. % Ag.

Fuel Cell Electrodes

IONICS INC.

U.S. Patent 3,152,014

A fuel cell consisting of a pair of spaced porous electrodes each of which is in contact with an ion-permeable membrane uses as both oxidant and fuel electrodes a porous C impregnated with Pt or preferably a porous structure activated by Rh, Pt, Ir or Pd.

Palladium Electrode for Fuel Cells

INSTITUT FRANCAIS DU PETROLE, DES CARBURANTS ET LUBRIFIANTS

French Patent 1,368,109

An electrode for fuel cells operating at 150-300°C is constituted by a thin Pd foil of practically negligible porosity yet permeable to H.

TEMPERATURE MEASUREMENT

Multi-junction Thermocouples

G. S. BACHMAN

British Patent 974,070

Multi-junction thermocouple suitable for refractory furnaces utilises wires of Pt used in conjunction with Pt-Ir or Pt-Rh alloy wires arranged so that, when part of the junction wire is eroded, the Pd wire or strip, placed between the junction wires, melts and provides a new hot junction.

Electrical Resistance Elements

JOHNSON, MATTHEY & CO. LTD.

British Patent 981,807

Electrical resistance elements suitable for use as heater elements or as thermocouple elements consist of a sintered refractory ceramic material core and a Pt group metal or its alloy as the external layer which will not alloy with the ceramic at the operating temperature.