

and Pd catalysts at 280–450°C to form HNCO in yields of 60–75%. Major products are ammonium cyanate at low temperatures and NH₃ or N₂ at high temperatures. The total conversion NO→N₂→NCO is 73% for Pd and 86% for Ir.

Study of Palladium State in Pd/SiO₂ Supported Catalysts in Ethylene Carbonylation

A. L. LAPIDUS, S. D. PIROZHKOVA, A. R. SHARIPOVA, A. N. DETYUK, R. V. DMITRIEV and KH. M. MINACHEV, *Izv. Akad. Nauk S.S.S.R., Ser. Khim.*, 1978, (11), 2627–2629

A study of the Pd state in 0.1–3.0% Pd/SiO₂ was carried out during carbonylation of C₂H₄ in the presence of C₂H₅COOH in a rotating autoclave. Carbonylation conversion of C₂H₄ over 0.5% Pd/SiO₂ was 82.4 and the yield of propynoic acid was 73.5%. Pd(o) was the catalytically active form.

HOMOGENEOUS CATALYSIS

Activation of Molecular Hydrogen by Transition Metal Complexes. I. Autocatalysis in Hydrogenation of [(PPh₃)Pd(OAc)₂]₂

A. S. BERENBLYUM, A. G. KNIZHNIK, S. L. MUND and I. I. MOISEEV, *Izv. Akad. Nauk S.S.S.R., Ser. Khim.*, 1978, (12), 2711–2714

Activation of H₂ with [LPd(OAc)₂]₂ (L = PPh₃) prepared in solutions of 2.21g of 10⁻² mol Pd(OAc)₂, 2.62g of 10⁻² mol PPh₃ and 10 ml toluene was found to have autocatalytic character. The induction period of the reaction depended on the nature of the solvent and on component concentrations; increasing with the decrease of the Pd complex and H concentrations and with the increase of the PPh₃ concentration.

Lewis Acid Influenced Ethylene Hydrogenation by Rhodium(I) Complexes

S. H. STRAUSS and D. F. SHRIVER, *Inorg. Chem.*, 1978, 17, (11), 3069–3074

The hydrogenation of ethylene at subatmospheric pressures in benzene was catalysed by RhCl(PPh₃)₃, RhH(PPh₃)₃ and RhH(PPh₃)₄ with and without

added Lewis acids. RhH(PPh₃)₃ is produced from the system RhCl(PPh₃)₃ and AlEt₃. RhH(PPh₃)₃ is 39 times more active than RhCl(PPh₃)₃. A mechanism for hydrogenation by RhH(PPh₃)₃ is proposed. It appears that there are sites on Rh(I) hydrides which are more basic than triphenylphosphine towards common Lewis acids.

Hydrogen Evolution from Water by Visible Light, a Homogeneous Three Component Test System for Redox Catalysis

K. KALYANASUNDARAM, J. KIWI and M. GRÄTZEL, *Helv. Chim. Acta*, 1978, 61, (7), 2720–2730

Irradiation by visible light of a neutral aqueous solution containing Ru(bipy)₃²⁺ as a sensitizer, methylviologen (MV²⁺) as an electron acceptor, and triethanolamine or cysteine as an electron donor, leads to the formation of the stable methylviologen radical cation (MV^{•+}). In the presence of PtO₂ as catalyst, MV^{•+} was oxidised by H₂O with simultaneous H₂ evolution.

ELECTRICAL AND ELECTRONIC ENGINEERING

Deep Levels of Platinum in Silicon

P. M. SANDOW, M. B. DAS and J. STACH, *J. Electron. Materials*, 1978, 7, (5), 687–703

Pt was introduced into n- and p-type Si and its energy levels and distribution examined. Pt concentration follows the B concentration near the junction in p-type Si. Pt may be useful as a means of lifetime-control in Si.

Recent Progress in Thin-Film Solar Cells

J. I. B. WILSON, J. MCGILL and D. WEAIRE, *Adv. Phys.*, 1978, 27, (3), 365–385

Recent work on thin-film solar cells based on doped amorphous silicon, including the development of a large area Si cell using a Pd M-I-S structure (50 cm² cells giving 600 mV in open-circuit and 2 mA/cm in short-circuit) is reviewed in detail. (80 Refs.)

NEW PATENTS

METALS AND ALLOYS

Skin-Melted Metal Articles

UNITED TECHNOLOGIES CORP.

British Patent 1,530,776

The use of Pd-Cu-Si alloys is described with reference to metallic articles having surface layers with metallurgical structures and properties which differ from those of the substrate.

ELECTROCHEMISTRY

Fungicides

HOECHST A.G.

British Patent 1,528,838

Alkoxyacyl cyclic amines, useful as agricultural fungicides, are obtained by electrolysis of the acylamines in alcohol. The electrodes are nets or plates of Pt or Pd, or the cathode is a base metal coated with a platinum group metal.

Fuel Cell Electrodes

UNITED TECHNOLOGIES CORP.

British Patent 1,529,539

Thin, light weight electrodes are obtained by spraying a C membrane or Au or Ag gauze with a suspension of p.t.f.e. and a catalytically active material, such as Pt black, platinised C or a mixture of Pd and Pt.

Fuel Cell Electrodes

STAMICARBON B.V.

British Patent 1,535,997

The internal resistance of porous fuel cell electrodes is reduced by the incorporation of very fine ($>20 \mu\text{m}$) fibres of electrically conductive material, such as Pt, Au, Ag and their alloys.

Platinum Group Metal Coatings for Valve Metal Electrodes

ALLIED CHEMICAL CORP.

U.S. Patent 4,108,745

Valve metal electrodes with a conductive coating of one or more Pt metals or oxides and Se oxide have enhanced catalytic activity for O_2 evolution in both acidic and alkaline media.

ELECTRODEPOSITION AND SURFACE COATINGS

Electrodeposition of Palladium-Nickel Alloys

SCHERING A.G.

British Patent 1,536,462

Lustrous coatings of Pd-Ni alloys having suitable alloying ratios may be obtained by electroplating the metals from an aqueous ammoniacal bath in which they are present as complexes of compounds containing N_2 and/or O_2 , such as amines, amino-carboxylic acids or ketocarboxylic acids. Alanine, glycine, glyoxalic acid and polyalkylenepolyamines are used as complexing agents.

LABORATORY APPARATUS AND TECHNIQUE

Alumina Crystals

UNION CARBIDE CORP.

British Patent 1,530,608

Al_2O_3 single crystals, used for optical windows, are obtained by drawing from a melt contained in a crucible which is preferably fabricated from Ir.

Hydrogen Diffusion Membrane

EUROPEAN ATOMIC ENERGY COMMUNITY

British Patent 1,533,285

The membrane is an alloy of Pd with 5-25% Sn or 2-7% Si or 4-23% Sn and 1-3% Si.

Diffusion Membranes

DONET, POLITEKHN. INST. and SVERDLOV, ZAVOD PO OBRABOT. TSVET. METAL.

British Patent 1,536,101

The manufacture of seamless capillary thin-walled vacuum-tight pipes from Pd alloys, for use as H_2 diffusion membranes, is described.

Platinum Group Metal Coatings for Electrodes

U.O.P. INC.

U.S. Patent 4,119,513

An O_2 sensor for use in industrial air/fuel control systems has platinum group metal coatings on the electrode sensing and reference surfaces. The preferred metal is Pt.

Gas Sensor

ROBERT BOSCH G.M.B.H.

German Offen. 2,709,173

A sensor for use in an I.C.E. exhaust system consists of a solid-electrolyte bed, with three non-catalytic electrodes, which are Au, and three catalytic electrodes which are a platinum group metal or its alloy.

Hydrogen Pressure Measurement

DEUTSCHE AUTOMOBILGESELLSCHAFT M.B.H.

German Offen. 2,710,847

The partial pressure of H_2 in a gas mixture is determined by measuring the effect of the gas on the dimensions of a H_2 absorbing substance, such as a foil of Ni, Pd or Pd alloy or a TiNi_3 single crystal.

Vinyl Chloride Determination

E. ASENDORF

German Offen. 2,716,963

The concentration of vinyl chloride in a gas stream is determined by measuring the amount of HCl evolved when it is decomposed with steam over a Pt or Pt alloy catalyst.

HETEROGENEOUS CATALYSIS

Lactams

BEECHAM GROUP LTD.

British Patent 1,529,913

In the synthesis of carbomethoxymethylene lactams of pharmacological interest, protective groups may be removed by hydrogenolysis in the presence of Pd/charcoal.

Oxidation Catalysts

PETRO-TEX CHEMICAL CORP.

British Patent 1,534,437

A mixed metal oxide catalyst for the oxidation of butane to maleic anhydride may include Ru, Ce and/or Nd.

Kanamycins

BRISTOL-MYERS CO.

British Patent 1,535,215

In the synthesis of kanamycin derivatives with biological activity, protective benzyloxycarbonyl groups may be removed by hydrogenolysis, preferably in the presence of Pd/carbon.

Pyrazolium Compounds

AMERICAN CYANAMID CO.

British Patent 1,536,493

The synthesis of pyrazolium derivatives useful as herbicides and fungicides may include a hydrodehalogenation reaction carried out in the presence of Pd/C or Pt/C.

Naphtha Reforming

U.O.P. INC.

U.S. Patent 4,104,154

Naphtha may be reformed using a catalytic composite containing platinum group metals (and optionally other metals) on an Al_2O_3 support obtained from an Al_2O_3 monohydrate, suspended in aqueous alkali, which is reacted with a strong acid salt such as Al nitrate.

Catalytic Steam Reforming

BRITISH GAS CORP.

U.S. Patent 4,104,201

A catalyst for steam reforming at high pressures and low temperatures (resistant to polymer deactivation) contains 25–75% Ni deposited on 75–25% Al_2O_3 and calcined and then treated to deposit up to 0.8% Ru.

Ruthenium Containing Perovskite

Compositions

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 4,107,163

The complexes $\text{MM}'_2\text{RuO}_6$ (M is Y, Bi or a lanthanide, M' is Ba or Sr) with a perovskite-type crystal structure are used as emission catalysts for NO_x reduction and CO oxidation.

Platinum-Rhodium Oxidation Catalyst

E. I. DU PONT DE NEMOURS & CO.

U.S. Patent 4,107,278

In an Andrussov-type process for preparing HCN from methane and ammonia, the activity of the Pt-Rh alloy catalyst is improved by adding CO_2 to the reactants.

Platinum Group Metal/Alumina Catalyst

COMSTOOK & WESCOTT INC.

U.S. Patent 4,108,797

A catalyst for the self-ignition and combustion of fuels, such as lower alcohols, consists of a small pellet of $\alpha\text{-Al}_2\text{O}_3$ integrated with 16–60% of a platinum group metal.

Rhodium and Ruthenium Impregnated Carbon Catalysts

UNIVERSITE DE SHERBROOKE *U.S. Patent 4,113,651*

A carbon supported metal, Rh or Ru, catalyst is prepared by impregnating a peat material with an aqueous solution of the metal salt followed by drying and pyrolysis in an inert atmosphere.

Platinum Group Metal Promoter for Water Purification Catalysts

PHILLIPS PETROLEUM CO. *U.S. Patent 4,115,264*

A catalyst for the liquid phase oxidation of organically polluted water contains Pt, Pd, K, La and/or Ce as a promoter.

Multimetal Dehydrocyclisation Catalyst

U.O.P. INC.

U.S. Patent 4,119,529

A dehydrocyclisation catalyst consists of a porous carrier, 0.01–2.0% Pt or Pd, 0.01–2.0% Rh, 0.05–5.0% Co and 0.1–3.5% halogen.

Platinum or Palladium Catalyst Reactivation

ASHLAND OIL INC.

U.S. Patent 4,120,819

Pd or Pt catalyst values poisoned in the course of catalysing the reductive alkylation of an acid hydrazide are completely reactivated by treatment with a dilute aqueous solution of a lower monocarboxylic or mineral acid and contacting the resultant slurry with O_2 .

Ruthenium Catalyst for Production of Hydrocarbons

CONTINENTAL OIL CO.

U.S. Patent 4,120,881

Predominantly aliphatic lower hydrocarbon materials are obtained by treatment of carbonaceous solids in a process which involves gasification and reaction with a Ru catalyst.

Gas Turbine

JOHNSON MATTHEY & CO. LTD.

German Offen. 2,809,407

A gas turbine includes a monolithic catalytic burner of heat resistant metal, such as Ru, Rh, Pd, Ir, Pt or their alloys, or a base metal alloy, such as a Ni-Cr alloy or an Fe alloy containing Al, Cr and up to 3% Y. The metal substrate may be coated with a first layer of refractory oxide, which may be a lanthanide metal oxide, and a second layer of catalytically active metal chosen from Ru, Rh, Pd, Ir, Pt, Ag, Au and their alloys.

Metal Supported Catalysts for Methanation

JOHNSON MATTHEY & CO. LTD.

German Offen. 2,813,329

The formation of methane from synthesis gas is catalysed by active material deposited on the surface of channels in a solid metal block. The block may be of base and/or noble metal alloy, and the active material is at least one of Ni, Re, Rh, Pd, Ir, Pt or preferably Ru.

Hydrocarbon Cracking Catalyst

G. N. MASLYANSKII ET AL *Russian Patent 404,302*

A catalyst consisting of Al_2O_3 supporting up to 2% Pt is stabilised by the inclusion of 0.01–0.1% Rh.

Reforming Catalyst

G. N. MASLYANSKII ET AL *Russian Patent 508,991*

The catalyst contains 0.3–0.35% Pt, 0.1–0.5% Pd, 0.95–1.25% halogen, together with 0.1–1.5% Cd and/or 0.05–1% Zn, supported on $\gamma\text{-Al}_2\text{O}_3$.

HOMOGENEOUS CATALYSIS

Alcohol Dehydrogenation

NATIONAL RESEARCH DEVELOPMENT CORP.

British Patent 1,530,447

Aldehydes and ketones are produced by dehydrogenation of alcohols in the presence of a catalyst which is a complex of Os or Ru, preferably $\text{Ru}(\text{RCO}_2)_2(\text{CO})(\text{PPh}_3)_2$ where R is CF_3 or C_2F_5 .

Rhodium Carbonyl Catalyst for the Water Gas Shift Reaction

UNIVERSITY OF ROCHESTER *U.S. Patent 4,107,076*
The catalyst, for the H_2O gas shift reaction, consists of $\{Rh(CO)_2Cl\}_2$, an iodide salt of a non-reacting cation and one of HCl , HBF_4 , H_2O and acetic acid.

Molten Triphenylphosphine Hydroformylation

JOHNSON MATTHEY & CO. LTD.
U.S. Patent 4,108,905
A gas phase hydroformylation process for the production of butyraldehyde from propylene uses, as catalyst, a Rh hydrido carbonyl phosphine complex, and is carried out in the absence of solvent and in the presence of excess molten phosphine, such as triphenylphosphine.

Ruthenium Phosphine Hydride Catalyst

PHILLIPS PETROLEUM CO. *U.S. Patent 4,117,016*
Structural modification of unsaturated alcohols is achieved by contacting the alcohol with a Ru complex of formula $\{Ru(PR_3)_3HX_2Y_m\}$ (R is 1-10C hydrocarbyl, X is H or halogen, Y is CO or PR_3 , m is 0 or 1).

Platinum Group Metal Catalyst for Asymmetric Hydrogenation Reactions

MONSANTO CO. *U.S. Patent 4,119,652*
A catalyst for the homogeneous catalytic hydrogenation of olefins to give an optically active mixture of products is ML_3X_n where M is Rh, Ir or Ru and possibly Os, Pd or Pt, L is a phosphine or arsine and X is an anion.

CHEMICAL TECHNOLOGY

Diffusion-Transfer Photographic Method

FUJI PHOTO FILM CO. LTD.
British Patent 1,531,240
A positive print and a transparent negative of a photograph are obtained simultaneously and immediately by diffusion-transfer means. The Ag halide emulsion may be sensitised by Au, Pd or Pt.

Platinum Catalyst for Silicone Rubber Composition

GENERAL ELECTRIC CO. *U.S. Patent 4,102,852*
A self-extinguishing room temperature vulcanisable silicone rubber composition contains 1-100 ppm Pt.

Europium Reagent for Solar Water Photolysis

R. A. FROSCHE *U.S. Patent 4,105,517*
Europium photo-oxidisable reagents for use in the solar photolysis of water are regenerated by being reduced with a Ru ligand complex. The photolysis products may contain an insoluble H_2 recombination catalyst such as Pt, Rh, Ir, Os or Ni.

Noble Metal Layer for Photochromic Systems

POLAROID CORP. *U.S. Patent 4,106,861*
Light transmitting photochromic articles, with low haze levels under illumination, have one layer containing Ag, Cu and halide ions and a layer of Au, Pt, Pd or Cr between this layer and a layer of halide impermeable material.

Film Membranes Containing Noble Metal Ions

STANDARD OIL CO. (INDIANA)
U.S. Patent 4,106,920
Hydrophilic semipermeable film membranes with an increase in pore size can contain Ag, Au, Pt, Pd, Rh, Ru, Os, etc. They are used to separate ethylene from ethane and methane.

Noble Metal Dopants for Refractories

OWENS CORNING FIBREGLASS CORP.
U.S. Patent 4,107,450
The refractory of use in electric furnaces consists of a crystalline oxide lattice of a Group IV, V or VI element doped with Ru, Pt, Pd, Sc, Y, etc.

Ceric Hydrate in Flame Retardant Compositions

DOW CORNING CORP. *U.S. Patent 4,108,825*
A flame retardant silicone elastomer composition contains a Pt catalyst.

ELECTRICAL AND ELECTRONIC ENGINEERING

Light Conductors

SIEMENS A.G. *British Patent 1,530,091*
A method is described of attaching Au or Pt electrodes to crystals of electro-optical material, such as Li niobate or tantalate.

Ordered Alloys

SONY CORP. *British Patent 1,530,459*
Ordered alloys, used for instance in magnetic recording media or electric contacts, are obtained by providing a solid base layer of Ni and/or Co, depositing Pt on the base layer and heating at a temperature below the order/disorder transformation temperature to cause diffusion.

Resistors

ALLIED CHEMICAL CORP. *British Patent 1,530,910*
Precision resistors are fabricated from amorphous alloys containing 13-30 at. % of at least one metalloid and 70-87 at. % of at least one transition metal, which may be a platinum group metal.

Resistance Materials

PHILIPS ELECTRONIC & ASSOCIATED INDUSTRIES LTD.
British Patent 1,535,139
A resistance material with a negative thermal coefficient of resistance is a mixture of a binder

and a metal rhodate $M_3Rh_7O_{15}$, where M is preferably Pb or Sr.

Display Device

INTERNATIONAL BUSINESS MACHINES CORP.
British Patent 1,535,684

Electrochromic display devices include transparent electrodes which may be thin layers of Au or Pt.

Thin Film Strain Gauge

GENERAL ELECTRIC CO. *U.S. Patent 4,104,605*

Protection against corrosion and erosion is provided by coating the thin film of resistive material such as Pt with an insulating film such as Al_2O_3 .

Gallium Arsenide Schottky Barrier Field Effect Transistors

BELL TELEPHONE LABORATORIES INC.
U.S. Patent 4,104,672

An integrated high power FET features gate cross-under fingers made from a Ti-Pt-Au sandwich.

Metal Rhodate Resistance Determining Material

U.S. PHILIPS CORP. *U.S. Patent 4,107,387*
The material consists of a glass binder, metal oxides and $M_3Rh_7O_{15}$ (M is Pb). It can also optionally contain $M'_2M''_2O_{6-7}$ (M' is Rb, M'' is Ru, Os or Ir).

Palladium and Gold Laminate Film

E. I. DU PONT DE NEMOURS & CO.
U.S. Patent 4,109,052

A film laminate with low surface resistivity, high abrasion resistance and high light transmission consists of a polymeric substrate layer and a transparent metal layer, of for instance Pd or Au, bonded to the substrate by a polymeric coupler.

Platinum Metal Layer for Anode Target

GENERAL ELECTRIC CO. *U.S. Patent 4,119,879*

A graphite disc assembly for a rotating X-ray tube has a graphite substrate and an anode target of either W or W/Re joined to the substrate by a layer of Rh, Os, Ru, Pt, Pt/Cr or Pd.

Emission Cathode

LICENTIA PATENT-VERWALTUNGS-G.M.B.H.
German Offen. 2,720,553

The cathode is of sintered W impregnated with a platinum group metal, preferably Ir.

Conductive Patterns

N.V. PHILIPS GLOEILAMPENFABRIEKEN
Dutch Appl. 77.04238

A nonconducting surface such as glass is provided with an electrostatic image on which catalytic nuclei (Pd black) are deposited. A reinforcing layer is subsequently applied from a metal/binder suspension.

TEMPERATURE MEASUREMENT

Platinum Wires for Self-Heating Thermocouple

SIDBEC-DOSCO LTEE *U.S. Patent 4,102,708*

The thermocouple which is used for continuously monitoring the internal surface temperature of a refractory lining in a metallurgical furnace has two dissimilar metallic wires contained in a sheath. The wires are of Pt and a Pt-Rh alloy.

MEDICAL USES

Branched Chain Amine Complexes of Platinum

RUSTENBURG PLATINUM MINES LTD.
British Patent 1,531,211

A Pt compound for the treatment of cancer has the formula (A)(B)Pt(X)(Y) in which X and Y are the same or different halogenoid groups and A and B are the same or different branched chain aliphatic amine groups.

Heart Pacers

AMERICAN OPTICAL CORP. *British Patent 1,535,210*
Heart pacers have porous metal electrodes preferably made from sintered Pt dust.

Dental and Jewellery Alloys

HOWMEDICA INC. *British Patent 1,536,091*
Useful Au-coloured alloys with good soldering properties contain, in weight %: Au 60-70, Pt 0-10 and Pd 0-10 total 4.99-10, Cu 10-25, Ga 5-10 and Ir 0-0.01.

Cardiac Pacemaker

GREATER GLASGOW HEALTH BOARD
British Patent 1,536,270

A pacemaker has lead wires of Pt or Pt-Ir alloy which are sheathed in a flexible insulating material such as silicone rubber. As a safety measure in case of rupture of the wire, a secondary path is provided by a Pt coating on the internal surface of the sheath.

Amine Complexes of Platinum (IV)

RUSTENBURG PLATINUM MINES LTD.
U.S. Patents 4,119,653-4

Pt co-ordination complexes for the treatment of cancer have the formula [(A)(B)Pt(X)(Y)trans(OH)₂] in which X and Y are halogenoids. In the first patent, A and B are selected from straight chain aliphatic amines and in the second from branched chain aliphatic amines, the formula in both cases being $C_nR_{2n+1}NH_2$ in which n is 3-9 and the R groups are the same or different and are selected from H, aryl, alkaryl, (pseudo) halogen, OH, carbonyl, formyl, nitro, amido, amino, sulphonic acid and salts thereof and carboxylic acid and salts thereof and additionally (in 4,119,654) alkyl and aralkyl.