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 study of the Pd state in 0.1-3.0/₉ Pd/SiO₂ was carried out during carbonylation of C₂H₂ in the presence of C₂H₄COOH in a rotating autoclave. Carbonylation conversion of C₂H₂ over 0.5/₉ Pd/SiO₂ was 82.4 and the yield of propynoic acid was 73.5%. Pd(0) was the catalytically active form.

HYDROGEN GAS EVOLUTION FROM WATER BY VISIBLE LIGHT, A HOMOGENEOUS THREE COMPONENT TEST SYSTEM FOR REDOX CATALYSIS


Irradiation by visible light of a neutral aqueous solution containing Ru(bipy)₃²⁺ as a sensitisier, methylviologen (MV⁺) 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


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.

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 fungicides, are obtained by electrolysis of the reference to metal articles having surface layers with metallurgical structures and properties which differ from those of the substrate.
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 μm) 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 O₂ 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, and/or O, such as amines, amino-carboxylic acids or ketocarboxylic acids. Alanine, glycine, glyoxalic acid and polyalkylene-polyamines are used as complexing agents.

LABORATORY APPARATUS AND TECHNIQUE
Alumina Crystals
UNION CARBIDE CORP.  
British Patent 1,530,608
Al₂O₃ 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. POLYTEKHN. 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 H₂ diffusion membranes, is described.

Platinum Group Metal Coatings for Electrodes
U.O.P. INC.  
U.S. Patent 4,119,513
An O₂ 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 H₂ in a gas mixture is determined by measuring the effect of the gas on the dimensions of a H₂ absorbing substance, such as a foil of Ni, Pd or Pd alloy or a TiNi₃ single crystal.

Vinyl Chloride Determination
E. ASSENDORF  
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 11535,215
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 Al₂O₃ support obtained from an Al₂O₃ 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 5-75% Ni deposited on 75-25% Al₂O₃ 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 MM'₆RuO₄ (M is Y, Bi or a lanthanide, M' is Ba or Sr) with a perovskite-type crystal structure are used as emission catalysts for NOₓ 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 CO₂ 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 α-Al₂O₃ 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 mono-carboxylic or mineral acid and contacting the resultant slurry with O₂.

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 act as 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 Al₂O₃ 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 γ-Al₂O₃.

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 Ru(RCO₂)₃(CO)(PPh₃)₃ where R is CF₃ or C₂F₅.
Rhodium Carbonyl Catalyst for the Water Gas Shift Reaction
UNIVERSITY OF ROCHESTER U.S. Patent 4,107,076
The catalyst, for the H₂O gas shift reaction, consists of \( \text{Rh(CO)}_2\text{Cl}\), an iodide salt of a non-reacting cation and one of HCl, HBF₄, H₂O 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 \( \text{Ru(PR₃)₂XY}_m \) (R is I-IOC hydrocarbyl, X is H or halogen, Y is CO or PR₃, 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 \( \text{ML}_x \text{X}_y \), 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. FROSCH 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 H₂ 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.

ELECTRICAL AND ELECTRONIC ENGINEERING

Light Conductors
SIEMENS A.G. British Patent 1,530,910
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 $M_2Rh_5O_{13}$, 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 $Al_2O_3$.

**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 $M_2Rh_5O_{13}$ ($M$ is Pb). It can also optionally contain $M'_2M''_2O_{4-7}$ ($M'$ is Rb, $M''$ is Ru, Os or Ir).

**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 $[(A)(B)Pt(X)(Y)trans(OH)]_n$ 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, alkyl, alkenyl, (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.