

ABSTRACTS

of current literature on the platinum metals and their alloys

PROPERTIES

Heat Capacity of Palladium below 4.2°K

J. A. RAYNE, *Phys. Rev.*, 1957, 107, (3), 669-670
The measurements were made on extremely pure Pd. The values of electronic heat capacity, $\gamma = (9.87 \pm 0.11) \times 10^{-3}$ joule/mole/degree² and Debye temperature, $\theta = 299 \pm 12^\circ\text{K}$ differ from previous results. These discrepancies are investigated by finding the effect of changes in the physical and chemical state of the specimen on these measurements.

Electrical Resistivity and Thermoelectric Potential of Rhenium Metal

G. B. GAINES and C. T. SIMS, A.S.T.M. Preprint No. 75, 1957, 10 pp.

Measurements were made of the resistivity and temperature coefficient of resistivity of Re from room temperature to 2600°K and the thermoelectric potentials at Re-Mo, Re-W and Re-Ta junctions from 870-2490°C. The resistivities of 1 and 2% Re-Pt alloys measured at 25°C were 19.9 and 25.8 microhm-cm respectively. Re-Mo and Re-W show promise as thermocouples up to 2600°C in neutral or reducing atmospheres. The thermoelectric potential at Pt : 1% Re-Pt and Pt : 2% Re-Pt junctions was investigated up to 1300°C and results found to agree with previous work.

Constitution of Uranium and the Platinum Metals

J. J. PARK and R. W. BUZZARD, U.S. Atomic Energy Comm. Report TID-7526, 89-102

The binary alloys of U with the Pt metals were investigated by means of thermal analysis, metallographic examination and X-ray diffraction methods. A complete tentative phase diagram for the Pt-U system is given which shows two eutectics and four intermetallic compounds—UPt, UPt₂, UPt₃ and UPt₆. Tentative phase diagrams for U-Ru up to 50 wt.% Ru and U-Pd up to 40 wt.% Pd are given. In the U-Ru system a eutectic occurs at ~885°C and 12% Ru and three compounds, U₃Ru, URu and URu₃, are formed. The presence of a eutectic and a compound UPd₃ in the U-Pd system was noted (*Platinum Metals Rev.*, 1957, 1, (1), 27). Alloys containing 0-40 wt.% Rh and 0-20 wt.% Os were prepared but little quantitative data has so far been obtained. An attempt to prepare U-Ir alloys resulted in a violent exothermic reaction. The presence of any of the metals in solution in U lowers both its γ - β and β - α phase transformation points.

Some attempt is made to correlate the data on the solubilities of the transition metals in U with properties of the metals.

Palladium Hydride I—The Thermodynamic Properties of Pd₂H between 273 and 345°K

D. M. NACE and J. G. ASTON, *J. Amer. Chem. Soc.*, 1957, 79, (14), 3619-3623

Series of equilibrium pressure and heat of absorption measurements were carried out for hydrogen on a sample of very active Pd black. The characteristics of the 30°C isotherm indicated that true equilibrium had been reached. Partial molar heats of absorption and desorption were measured. The values obtained were used to calculate the free energy and entropy change associated with the formation of Pd₂H from its elements at 30°C.

II—The Entropy of Pd₂H at 0°K

ibid., 3623-3626

The heat capacity contribution due to absorbed H atoms in Pd hydride at a composition of nearly Pd₂H was measured over small temperature intervals from 16-340°K. The residual entropy at 0°K was calculated from experimental data to be 0.59 ± 0.18 e.u. It was concluded that Pd₂H does not approach a completely ordered state at low temperatures and so is not a true compound. The shape of the heat capacity curve indicates the probability of co-valently bound H at low temperatures.

III—Thermodynamic Study of Pd₂D from 15 to 303°K. Evidence for the Tetrahedral PdH₄ Structure in Palladium Hydride.

ibid., 3627-3633

The heat capacity of Pd₂D was measured and compared with Pd₂H. A similar curve was obtained. From the low-temperature properties of Pd₂H a structural model—PdH₄.7Pd—is proposed in which one out of every eight atoms in the Pd lattice has four H atoms co-valently bonded to it. A theoretical heat capacity curve for this model gives good agreement with experimental values below 120°K. Above 120° a dissociation process is postulated to account for the discrepancy between theory and experiment, which involves a decrease in the number of hydrogen bonds as the temperature is raised. Hydrogen diffusion through Pd is conceived as a movement of H atoms by a combination of rotation about a parent Pd atom and bonding to, then subsequent rotation about, a neighbouring Pd atom.

Properties of Palladium-Rhodium Alloys

F. E. HOARE and J. PRESTON, *Nature*, 1957, **180**, (Aug. 17), 334

Values of the electronic heat coefficient, γ , as obtained from measurements below 4.2°K are given. The initial rise in γ above the value for Pd on adding Rh and subsequent decrease on increasing the Rh content is similar to the behaviour of the magnetic susceptibility. The results are discussed theoretically on the basis of the simple electron band theory.

Temperature Dependence of the Hall Coefficients in some Silver-Palladium Alloys

F. E. ALLISON and E. M. PUGH, *Phys. Rev.*, 1957, **107**, (1), 103-105

The Hall coefficient for Ag-Pd alloys containing 80 and 60% Pd was measured as a function of temperature from 4° to 300°K. It was found to be strongly temperature dependent. However the form of temperature dependence differs from that in the electronically analogous but ferromagnetic Cu-Ni alloys and corresponds to the type observed in some ferromagnetic transition metals above their Curie point.

Anomalous Behaviour of Silver-Palladium Alloys on Plastic Deformation

W. H. AARTS and A. S. HOUSTON-MACMILLAN, *Acta Met.*, 1957, **5**, (9), 525-527

The change on resistivity of Ag-Pd alloys when plastically deformed at the nitrogen point was investigated. The pure metals and the 50% alloy showed the expected increase in resistivity. For a 10% extension alloys in the range 10-47 at. % Pd showed a decrease in resistance, the greatest reduction occurring in the 40% alloy. For larger extension the resistivity increased again eventually surpassing the original value.

Palladium-Iridium Alloys

E. RAUB and W. PLATE, *Z. Metallkunde*, 1957, **48**, (8), 444-447

The system was studied by means of microscopic, X-ray and microhardness measurements. The solidus temperature was determined up to 25 at. % Ir, in which range it was practically identical to the melting point of Pd. The alloys crystallise in a continuous series of solid solution. At low temperatures an extensive two-phase region is formed as in the Pt-Ir alloys (*Platinum Metals Rev.*, 1957, **1**, (1), 27). The critical point of the miscibility gap is at 1480° and 45-50 at. % Ir. This is 400° higher than in the Pt-Ir system which is explained by the higher segregation velocity of the Pd-Ir alloys. The hardness of the quenched alloys increases with Ir content up to 50 at. % Ir where the micro-hardness is ~ 570 and then falls gradually. On tempering at 700° for periods up to 20 hours only the 7.6-15.9 at. % Ir alloys show any age-hardening. With tempering times up to 1100 hours these alloys show a large increase in hardness, the 15.9 alloy

reaching a value 2.5 times that when quenched. The hardness of the Ir-rich alloys falls on tempering up to 150 hours and then rises slowly.

Sigma Phases Containing Osmium and Iridium

M. V. NEVITT and J. W. DOWNEY, *J. Metals*, 1957, **9**, (8), 1072

Sigma-phases were found in the systems Os-Ta, Os-W and Ir-Ta. The composition ranges and lattice constants are given. The composition range found for the Os-W σ -phase agrees with previous work by Raub but the lattice constants are different. The reason for this is not known.

ELECTROCHEMISTRY

Studies of Gold, Platinum and Palladium Indicating Electrodes in Strongly Oxidising Aqueous Solutions

J. K. LEE, R. N. ADAMS and C. E. BRICKER, *Anal. Chim. Acta*, 1957, **17**, (3), 321-328

A comparison of the behaviour of the electrodes in strongly oxidising solutions (e.g. permanganate, dichromate) with their behaviour on anodic oxidation reveals that the same reactions are involved. These reactions are attributed to oxide (or hydroxide) film formation since the potentials at which the reactions occur agree fairly well with the potentials of the known oxide-metal transitions.

Studies on Electrolytic Anodes Part I: On Surface States of the Platinum Anode I Synthesis of Hydrated Platinum Oxides and their X-ray Examination

T. INOUE, *J. Electrochem. Soc. Japan*, 1957, **25**, (7), E-83-84 (English Summary)

Pt₂O₂nH₂O was synthesised by two methods and X-ray diffraction patterns were obtained as a preliminary to investigating the surface of Pt electrodes by X-ray techniques.

Investigation of Oxygen Covered Silver and Platinum by means of Voltapotential and Charging Curves

G. RÄDLEIN, *Z. Elektrochem.*, 1957, **61**, (6), 727-733

Volta potential measurements and charging curves are influenced by the type of oxide film produced on the metal surface. These oxide films were shown, by a thermodynamic treatment of the results, to have different binding affinities for the metals, some even being unstable.

The Mechanism of the Hydrogen Evolution Reaction on Platinum, Silver and Tungsten Surfaces in Acid Solutions

J. O'M. BOCKRIS, I. A. AMMAR and A. K. M. S. HUQ, *J. Phys. Chem.*, 1957, **61**, (7), 879-886

Parameters of the H₂ evolution reaction on Pt have been determined as a function of current density, pH, salt addition, mode of electrode

preparation, ageing and degree of pre-electrolysis and for W and Ag as a function of current density and degree of pre-electrolysis. On Pt, Tafel-slopes and exchange currents (i_0) vary with the mode of preparation. Anodic activation gives a high and reproducible i_0 , ageing decreases it and successive increases in pre-electrolysis cause it to increase to a limiting value.

Polarographic Characteristics of Osmium. I—The +8 State

L. MEITES, *J. Amer. Chem. Soc.*, 1957, **79**, (17), 4361-4367

The equilibria involved in the reduction of Os^{8+} from a number of common supporting electrolytes at both dropping and large stirred mercury electrodes were determined. In strongly acidic solution Os^{8+} is reduced directly to the +3 state; less strongly acidic solutions give an additional wave corresponding to the intermediate formation of Os^{4+} . Above pH 5 there is also a third wave representing the formation of Os^{6+} . The half-wave potentials and diffusion current constants of these waves under a wide variety of conditions are determined. In cyanide media Os is reduced immediately to the +6 state and polarograms of the resulting solutions show further reduction to Os^{2+} .

Mechanisms of Hydrogen Producing Reactions on Palladium. IV—Electrochemical Kinetics of the α -Palladium-Hydrogen System in Acid Solutions

J. P. HOARE and S. SCHULDINER, *J. Electrochem. Soc.*, 1957, **104**, (9), 564-568

Experiments were carried out by means of a Pd-bielectrode with Pt/ H_2 reference electrodes. The pH effect on the anodic and cathodic behaviour was determined and related to bi-electrode mechanisms. The thickness of the bi-electrode had no significant effect. The catalytic activity for the hydrogen producing reactions was less on α -Pd than on β -Pd. The electrode mechanisms at various current densities with different Tafel-slopes were discussed. The fraction of total current carried by proton flow in the bi-electrode was determined.

Points on the Electrode Surface where Gas Bubbles are most frequently formed during the Electrolysis of Water

T. MURAKAWA, *J. Electrochem. Soc. Japan*, 1957, **25**, (5), E-61 (English Summary)

Pt, Cu, Ni and Al electrodes were studied. Two reasons were found for the formation of gas, one was the increase in field strength especially along scratches and the other was the presence of impurities with an overpotential less than that of the electrode metal. On Pt at low current densities bubbles were formed only along the scratches and in about the same places whether the Pt was anode or cathode.

Electrolytic Partial Hydrogenation of 2-Butyne-1,4-diol with a Silver-Copper Cathode

J. KATO, M. SAKUMA and T. YAMADA, *J. Electrochem. Soc. Japan*, 1957, **25**, (6), E-73-74 (English Summary)

2-Butene-1, 4-diol was formed by partial hydrogenation of 2-butyne-1,4-diol in an electrolytic cell with a Pt wire anode and a Ag-Cu cathode. Saturated KOH and 2% KOH were used respectively as anolyte and catholyte and were separated by a diaphragm. A yield of 70-80% was obtained with a current of 1A/dm.² at 20°C.

Potential Measurements on Metal Catalysts in Aqueous Solution

K. SCHWABE, *Z. Elektrochem.*, 1957, **61**, (6), 744-752

Potential measurements on catalysts of platinised Pt whilst decomposing aqueous formic acid solution in the presence of oxygen are described. The results together with those of earlier investigations were discussed from the standpoint of electron acceptor action of the catalyst. A new clarification of the potential processes involved in the anodic oxidation of formic acid on Pt is given.

CATALYSIS

X-ray Investigation of the Dependence of the Structure of a Palladium Catalyst on the Conditions of its Electrolytic and Heat Treatment

V. D. RUCHKINA, *Bull. Acad. Sci. U.S.S.R. (Physical Series)*, 1956, **20**, (7), 693-695 (English Transl.)

The current density in the electrolytic preparation of Pd has a profound influence on crystal size, which decreases with increasing current density, on the parameters and on the degree of perfection of the Pd lattice. The dependence of lattice parameters on the temperature of heating in hydrogen varies with the initial state of the Pd.

Rate Studies in Tubular Reactors

E. WEGER AND H. E. HOELSCHER, *Amer. Inst. Chem. Eng. J.*, 1957, **3**, (2), 153-156

The hydrogenation of olefin-1-hydrocarbons was studied in a tubular reactor coated internally with a Pd-C catalyst. The purpose was to extend the knowledge required for the use of tubular reactors in kinetic investigations. The reaction conditions used were, temperature 30-45°C, Reynold's number 125-2300 and a composition range of 58-95 mole% H_2 . The reaction was found to be rate controlled rather than diffusion controlled as expected. This was attributed to surface roughening due to catalyst deposition and a temperature gradient in the tube due to the exothermic reaction. These appear to be disadvantages in using tubular reactors in kinetic research.

Catalysed Gas-Liquid Reactions in Trickling-bed Reactors

B. D. BABCOCK, G. T. MEJDELL and O. A. HOUGEN, *Amer. Inst. Chem. Eng. J.*, 1957, **3**, (3), 366-372
Kinetic studies in a differential flow reactor of the trickling-bed type were carried out using the hydrogenation of liquid α -methylstyrene to cumene as a typical reaction. The catalysts used were 0.5% Pd-Al₂O₃ and 2% Pt-Al₂O₃, exploratory studies were also made using Rh, Ru and Ni catalysts. Experimentally determined reaction rates at constant catalytic activity were plotted as functions of concentration, temperature and pressure. From the results it was concluded that the surface reaction between adsorbed α -methylstyrene and H atoms is rate controlling on both Pd and Pt catalysts. A change in mechanism is observed at 3 atm. on the Pd catalyst which is explained by a phase-change in the Pd-H system. Above 3 atm. the α -methylstyrene and H atoms are absorbed on different types of active site, below 3 atm. on the same type of site. The Pd catalyst is about 10 times as active as Pt. Rh and Ru catalysts have negligible activity in this reaction and Ni causes the α -methylstyrene to polymerise.

The Reactions of Hydrocarbon Radicals on Metal Surfaces

G. C. BOND, *J. Oil Colour Chem. Assoc.*, 1957, **40**, (11), 895-911

The metal-catalysed hydrogenation of unsaturated hydrocarbons involves the intermediate formation of hydrocarbon radicals and reaction mechanisms are considered here on the basis of reactions undergone by these radicals on the metal surface. These mechanisms can be determined by the use of isotopes (e.g. deuterium) or by kinetic measurements. The reactions reviewed, using Ni and Pt metal catalysts, are ethylene and cyclopropane hydrogenation and hydrogenation of the acetylenic bond. The mechanisms obtained are related to the surface geometry and d-bond character of the metal and to the strength of adsorption of the radicals.

The Influence of Catalysts on the Reduction of Iron Ore with Hydrogen

W. MACHU and S. Y. EZZ, *Arch. Eisenhüttenwesen*, 1957, **28**, (7), 367-371

The effect of impregnation with metallic salts on the speed of reduction of iron ore with hydrogen was investigated with ore from Aswan. Over 100 pure salts or mixtures of salts were used. Cu, Ni and Pt catalysts had a clearly positive and W a clearly negative effect, but most substances were without influence. The roasting temperature of the ore after impregnation had a marked influence on the reduction rate; the optimum temperature varied with the salt used. The catalytic effect of these salts was only evident at low reduction temperatures of 250-400° Ni, Cu and Pt being the most active.

Catalytic Recombination of Radiolytic Gases in Aqueous Thoria Slurries

L. E. MORSE, U.S. Atomic Energy Comm., Report TID-7540, 143-154

"Out-of-pile" tests on possible catalysts for use in the internal recombination of radiolytic gases in ThO₂ slurries were carried out in stainless steel bombs. The best catalysts are Pd and MoO₃. Pd at a concentration of \sim 0.008M gives high reaction rates at 115-120°; above 120° the reaction tends to be explosive. The Pd is added to the slurry as PdO and reduced *in situ*. At 280° a high activity is shown by MoO₃ at a concentration of 0.05M. "In-pile" tests resulted in essentially complete recombination of aqueous ThO₂/UO₂ slurries containing these catalysts at the average power densities anticipated in a large-scale thorium breeder reactor. No decrease in catalytic activity was observed due to build up of Fe in the slurries.

Profits from Waste Gases

R. J. RUFF, *Chem. Eng. Progress*, 1957, **53**, (8), 377-380

Methods of utilising heat obtained from the catalytic oxidation of waste gases is described. The catalyst consists of activated Pt or Pt alloy applied to a nickel alloy screen capable of withstanding temperatures above 1800°F. The waste gases must be preheated to \sim 600°F. Several recycling systems and their application in formaldehyde manufacture, kettle cooking and heat curing operations are described. The heat produced is utilised in factory heating or in the latter case in providing the heat for the oven or dryer. In treating the tail gases from ethylene oxide and nitric acid plants catalytic pressure reactors are used and the gases from these can be used to drive gas turbines. A catalyst life exceeding 35,000 operating hours has been obtained.

Tidewater's Delaware Refinery: Catalytic Reformer

E. A. WHITE, JR., *Petroleum Processing*, 1957, **12**, (7), 122-124

The reformer, a 45,200 b/d twin-train Houdriformer, is the largest of its kind in the world. It contains a newly developed Pt-containing catalyst which can be regenerated *in situ*. The unit is designed to take wide variations in feed-stock. In a once-through regenerative operation reformates in excess of 95F-1 clear octane can be obtained and after aromatic extraction the octane number can reach 102-104F-1 clear. The reforming process and regenerating equipment are described.

Data on Latest Reforming Process

P. H. HOLT, II and R. R. HAIG, *Petroleum Refiner*, 1957, **36**, (9), 221-222

Describes Esso Research and Engineering Company's Powerforming process. This is a fixed-bed catalytic process using a regenerative Pt

catalyst. Desulphurised low octane naphthas can be upgraded to over 100 Research octane number clear with a yield of 60-80%.

The Houdriforming Unit of the Emsland Refining Company

H. NEUMANN, *Erdöl u. Kohle*, 1957, 10, (10), 664-666

A 3,500 b/d Houdriforming unit has been built at this refinery and went on stream in May 1956. The unit comprises an H₂S-stripper using a Co-Mo catalyst and a catalytic reformer using a Pt-containing catalyst.

Hydro-isomerisation of Paraffin Wax

F. BREIMER, H. I. WATERMAN and A. B. R. WEBER, *J. Inst. Petroleum*, 1957, 43, (Nov.), 297-306

The isomerisation of paraffin waxes as a method of obtaining low pour point lubricating oils of high viscosity index and diesel fuel of good cetane number was investigated and a means of selecting suitable catalysts is proposed. Paraffin wax (average mol. wt. 375) was vaporised with H₂ and contacted with a catalyst at 0.89-1.04 WHSV, 410-450°C, 32-102 atm. hydrogen pressure and a molar ratio H₂/wax of 61-183. The reaction products were distilled at atm. pressure to 300°C and the residues dewaxed at -20°C. The catalysts used were Al₂O₃, Al₂O₃-Cl, Pt-Al₂O₃-Cl, Pt-SiO₂-Cl, Pt-commercial Al₂O₃-Cl, CoMoO₄-Al₂O₃ and MoO₃-Al₂O₃-F. The results were interpreted by means of a pseudo-three-component system, the components being oil, unconverted wax and cracked products and the influence of reaction conditions and variations in preparation of the Pt catalysts on the distribution of these components is shown. It was found that the oil content of the reactant is related to the amount of cracked products by an equation of the second degree. A system of catalyst selection based on this equation is possible since from the result of one experiment under standard conditions, the course of the reaction under varying reaction conditions using the same catalyst can be forecast. On this basis the following catalysts were the most promising: CoMoO₄-Al₂O₃, MoO₃-Al₂O₃-F and Pt-Al₂O₃-Cl, and the Pt-Al₂O₃-Cl catalyst appears to be the best. At optimum conditions (cracked material=10-20 wt.%) the oils obtained have a pour point of -21° to -35°C, viscosity index of 106-145 and a viscosity at 100°F of 8.0-10.0 cS and at 210°F of 2.1-2.8 cS. With a Pt type catalyst a maximum oil yield of 67 wt.% was obtained.

The Catalytic Toxicity of Nitrogen Compounds. Part I. Toxicity of Ammonia and Amines

E. B. MAXTED and M. S. BIGGS, *J. Chem. Soc.*, 1957, (Sept.), 3844-3847

The toxicity was tested on a Pt black catalyst in the hydrogenation of cyclohexene and was

compared with that of the cyanide ion which forms a convenient standard for poisons containing nitrogen. Dry NH₃ has a toxicity 40% that of CN⁻, but this toxicity is suppressed by water indicating that the NH₄⁺ ion is not toxic. Two primary amines, n-butylamine and cyclohexylamine, have toxicities similar to NH₃ but the secondary amine dicyclohexylamine has a value <1% that of NH₃. Acetic acid reduced the toxicity of amines in a similar manner to water for NH₃.

New Methods of Preparative Organic Chemistry. II—8 Selective Catalytic Oxidation with Noble-Metal Catalysts

K. HEYNS and H. PAULSEN, *Angew. Chem.*, 1957, 69, (18/19), 600-608

Selective catalytic oxidation (dehydrogenation) with air or oxygen using Pt-C, PtO₂ and Pd catalysts is of great value especially in polyhydroxy and carbohydrate derivatives. A review of its use in this field is given. Experimental details of catalyst preparation and some representative reactions are given.

CATHODIC PROTECTION

Some Aspects of Cathodic Protection

W. G. WAITE, Corrosion Convention, London, Oct. 1957, Preprint 12 pp.

A general review of the methods of applying protection and the main uses. Galvanic and impressed current installations, choice of anode material and measurement of anode current are described. The use of cathodic protection in pipelines and tanks and for internal and external protection of ships' hulls is discussed. Pt metal anodes are advocated for the internal protection of pipes, for certain tank installations and in the external protection of ships' hulls.

GLASS TECHNOLOGY

Fundamentals of Glass-to-Metal Bonding. III—Temperature and Pressure Dependence of Wettability of Metals by Glass

R. M. FULRATH, S. P. MITOFF and J. A. PASK, *J. Amer. Ceram. Soc.*, 1957, 40, (8), 269-274

An improved apparatus is described which enables the interfacial energy between molten glass and a metal to be determined at pressures down to 10⁻⁵mm of Hg and temperatures up to 1400°C. The main work was done with Na₂O.2SiO₂ glass on Au, Pt and Fe, but Ti, Zr, Mo, W and Ta were also studied. The contact angle observed on Au remained constant at 60° in the range 900-1040°C and 10⁻³-10⁻⁵mm. At 10⁻⁵mm the contact angle for Pt remained constant at 15° for temperatures 900-1300°C but at 10⁻³mm the contact angle was temperature dependent having a value of 55° at 1000°C. The

contact angle for Fe was temperature dependent even at 10^{-3} mm. The different behaviour on these metal surfaces is related to their affinity for oxygen, which is least for Au and greatest for Fe. The increase in wetting of Pt between 10^{-3} mm and atmospheric pressure was ascribed to a change in the glass-metal interfacial energies at the metal-glass-vapour junction.

The Development and Use of Glass Fibres

A. HUDSON DAVIES, *J. Roy. Soc. Arts*, 1957, **60**, (Apr.), 437-452 (Reprinted in *Glass*, 1957, **34**, (9), 403-410)

The manufacture, properties and uses of glass wool and continuous yarn are described. The molten glass is run into platinum bushings

provided with accurately formed tips to deliver the fibre. In making glass wool a blast of superheated steam breaks up the glass stream into individual fibres. In continuous filament yarn manufacture the glass thread is drawn through the forming tips at a constant speed and is then treated as a normal textile yarn. The temperature of the platinum bushings must be accurately controlled since this determines the temperature and hence the viscosity of the glass. Glass wool is used as an insulator in aircraft and buildings and in the protection of oil-pipe lines. Glass yarn has wide application as an insulator in the electrical industry but the most important future use is expected to be in glass-reinforced plastics for the aircraft, motor and shipbuilding industries.

NEW PATENTS

Manufacture of Amines

SOC. INDUSTRIELLE DES DERIVES DE L'ACETYLENE
British Patent 781,230

A platinum or palladium catalyst is used as a hydrogen transfer catalyst in the preparation of a primary C_1 to C_8 amine by reacting a primary or secondary C_1 to C_8 alcohol with ammonia at elevated temperature.

Cigarette Paper and Tobacco Products Made Therewith

J. DURANDEAUX *British Patent 781,539*

A tobacco smoking product, e.g. a cigarette is provided with an intermediary layer between the tobacco and the paper wrapping of a salt of a platinum group metal which acts catalytically to neutralise the products of combustion. The paper may be impregnated or coated with palladium chloride.

Preparation of Carbon-substituted Piperazines

WYANDOTTE CHEMICALS CORP. *British Patent 781,701*

A platinum or palladium hydrogenation/dehydrogenation catalyst may be used in the preparation of carbon-substituted piperazines by contacting an amino alcohol of given general formula with the catalyst at elevated temperature in the presence of water.

Manufacture of Unsaturated Compounds

F. HOFFMANN-LA ROCHE & CO. A.G. *British Patent 782,316*

A lead-poisoned palladium catalyst is used as a hydrogenation catalyst in a process of manufacturing all-*trans*-DL- α -carotene.

Complex Hydroxides

THE ATLANTIC REFINING CO. *British Patent 782,465*
Platinum or palladium complex amine hydroxides

in which the metal is in the complex ammine cation in aqueous solution are produced by passing an aqueous solution of the corresponding platinum or palladium salt over an anion exchange resin, the latter being in the hydroxyl cycle. Platinic (palladic) or platinum (palladous) ammine hydroxides may be produced by using the corresponding platinic or platinum ammine salt.

Increasing the Activity of Platinum-metal Catalysts

N. V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ
British Patent 782,787

The activity of a platinum metal-alumina catalyst is increased by contacting the catalyst at 250-550°C with a mixture of steam, oxygen and hydrogen chloride and/or hydrogen fluoride, the steam being present in a molar concentration at least fifty times that of the hydrogen halide. The treatment is continued until the catalyst has a desired halogen content. Chlorine and/or fluorine may be initially contained in the catalyst.

Catalysts

LAPORTE CHEMICALS LTD. *British Patent 783,590*

Hydrogen peroxide is decomposed by contacting a concentrated solution thereof with ruthenium or a compound of ruthenium, the latter being in the anionic or cationic state. Examples are given of the use of ruthenium sponge, ruthenium chloride solution, ruthenium metal on alumina and ruthenium black plated on nickel. The catalytic activity is stated to be far greater than any other of the platinum metals.

Manufacture of Hydrogen Peroxide

LAPORTE CHEMICALS LTD. *British Patent 783,708*

In a cyclic process for the manufacture of hydrogen peroxide by the alternate hydrogenation and auto-oxidation of phenazine or an alkyl substituted phenazine, the catalyst used in the