

# ABSTRACTS

of current literature on the platinum metals and their alloys

## PROPERTIES

### Osmium-Chromium Alloys

E. RAUB, *Z. Metallkunde*, 1957, **48**, (2), 53-56  
Alloys containing 15.4-80% Cr were studied to complete work on the alloys of the Pt metals with Cr, Mo and W. The alloys were heat-treated in argon or vacuum at temperatures from 600 to 1350°C, and micrographic and X-ray studies were carried out. A solid-solution of Cr in Os exists up to 22.6% Cr, then two intermediate phases  $\text{OsCr}_2$  and  $\text{OsCr}_3$  occur.  $\text{OsCr}_2$  has a  $\sigma$  phase structure similar to  $\text{RuCr}_2$ . It exists only at high temperatures, varying from above 1350°C for the 39% Cr alloy to above 900°C at 31.4% Cr.  $\text{OsCr}_3$  has a  $\beta$ - $\omega$ -structure. It is formed at low temperatures and is homogeneous over only a small composition range. A Cr-rich solid-solution occurs up to 27.7% Os. Alloys containing the  $\sigma$ -phase are brittle and easily powdered. The microvickers hardness curve rises to a sharp maximum of 1370 at the composition  $\text{OsCr}_2$ . When the  $\beta$ - $\omega$ -phase predominates the alloys are ductile and less hard. A survey of the structural relationships between alloys of the Pt metals with Cr, Mo and W is given.

### The Optical Properties of Thin Films of Palladium

D. MALE and J. TROMPETTE, *J. Phys. Radium*, 1957, **18**, (2), 128-130  
Pd was vaporised on to quartz or glass supports and measurements of reflection and transmission factors were carried out, at wavelengths 3021-5461Å. The indices of refraction and extinction and the filling coefficient were calculated. The results are tabulated. The reflection factors increase with the film thickness, the refractive index remains approximately constant and is  $>1$ . The filling coefficient tends to zero as the thickness diminishes.

### Self-Diffusion of Silver in Silver-Palladium Alloys

H. H. NACHTRIEB, J. PETIT and J. WEHRENBURG, *J. Chem. Physics*, 1957, **26**, (1), 106-109  
Self-diffusion of Ag into alloys containing 1.49, 3.69, 9.87 and 21.84 at. % Pd was studied by electroplating a layer of active  $^{110}\text{Ag}$  on to the base of the alloy samples. The diffusion was measured at 715.4, 799.4, 861.8 and 942.0°C. No variation in activation energy over this composition range was observed. Pd decreases the rate of self-diffusion of Ag such that  $\log D_{\text{Ag}}$  is

proportional to the atomic fraction of Pd, the fractional decrease in  $D_{\text{Ag}}$  being the same at all temperatures.  $D_{\text{Ag}}$  is also related to the solidus line of the Ag-Pd phase diagram and a simple corresponding states explanation is given.

### The Adsorption of Atoms and Molecules of Hydrogen on Platinum

J. C. P. MIGNOLET, *J. Chim. Phys.*, 1957, **54**, (1), 19-26

The adsorption was studied on evaporated films of Pt between  $-190^\circ$  and  $20^\circ\text{C}$ , by measuring surface potential. At low concentrations the surface potential is negative indicating an atomic hydrogen film. Near saturation it becomes positive showing the hydrogen to be adsorbed as molecules. This is confirmed by the volume of hydrogen adsorbed. The molecular layer is extremely stable having a heat of adsorption of about 15K cal./mol.

### Thermal and Electrical Conductivity of Rhodium, Iridium and Platinum

G. K. WHITE and S. B. WOODS, *Canad. J. Physics*, 1957, **35**, (3), 248-257

Measurements were carried out on very high purity metals at temperatures up to  $100^\circ\text{K}$  to study their electron transport properties. The "ideal" (total - impurity) thermal and electrical resistivities, particularly of Ir and Rh, decrease rapidly with temperature indicating that s-d transitions are not a dominant resistive mechanism under these conditions. This contrasts with earlier results for Pd, Ni and Fe. Below  $10^\circ\text{K}$  the electrical resistivity of Pt is  $\propto T^2\text{K}^2$  suggesting that electron-electron collisions are an important factor in the resistance mechanism.

### On the Superstructure of the Ordered Alloy $\text{Cu}_3\text{Pd}$

#### II X-RAY DIFFRACTION STUDY

M. HIRABAYASHI and S. OGAWA, *J. Phys. Soc. Japan*, 1957, **12**, (3), 259-271 (In English)

Alloys containing 15.5-28.5 at. % Pd were studied by X-ray diffraction using both powder and single crystal samples. Preliminary investigations on partially ordered specimens containing 20.8 and 25.2% Pd were carried out. Fully-ordered specimens were obtained by annealing at  $450^\circ\text{C}$  and cooling slowly over a period of 4 months. Ordered alloys containing 20.8-25.8% Pd have an anti-phase domain structure formed from the elementary f.c.t. lattice by step-shifts occurring at definite periods along the tetragonal axis. Alloys

with 27.3 and 28.5% Pd possess a more complicated anti-phase domain structure characterised by two types of out-of-step. Variation of lattice parameters and periods of anti-phase domain with composition were also studied. The results indicate that the composition of the ordered phase is  $\text{Cu}_3\text{Pd}$  and not  $\text{Cu}_4\text{Pd}$  as suggested by certain authors.

#### The Palladium-Gold-Cobalt System

A. T. GRIGOR'EV, E. M. SOKOLOVSKAYA, L. D. BUDENNAYA, I. A. IYUTINA and M. V. MAKSIMOVA *Zhur. Neorg. Khim.*, 1956, 1, 1052-1063 (*Chem. Abs.*, 1956, 50, 16629i)

The system was studied by means of thermal analysis. The separate Au-rich and Co-rich phases disappear as the Pd content increases forming solid solution. The range of this solid solution is from >47% Pd at room temperature to >35% Pd at 1000°C. Values of hardness, electrical resistivity and its temperature coefficient are given for certain compositions.

#### The Palladium-Copper-Cobalt System

A. T. GRIGOR'EV, L. A. PANTELEIMONOV, V. V. KUPRINA and L. I. RYBAKOVA, *Zhur. Neorg. Khim.*, 1956, 1, 1067-1073 (*Chem. Abs.*, 1956, 50, 16630b)

The system was studied by means of thermal and microstructural analysis. The mutual solubilities of Cu and Co increase with increasing Pd content. Above 55% Pd all alloys are solid solutions. Values of Brinell hardness, electrical resistivity and its temperature coefficient are given for specific compositions.

#### Processing and Properties of Cobalt-Platinum Permanent Magnet Alloys

D. L. MARTIN, Conference on Magnetism and Magnetic Materials, A.I.E.E., 1957, Feb., 188-202

The processing of alloys in the range 40-60 at. % Pt is described. The variation of magnetic properties with isothermal ageing, cooling rate and disordering temperature were determined. On ageing  $H_c$  and  $BH_{(\max)}$  increase to a maximum when the alloys are about 50% ordered. A cooling rate of 100°C/minute at 750°C is found to produce optimum magnetic properties in most alloys. By controlled cooling a 49.3% alloy gave  $H_c$  4700 oersteds and  $BH_{(\max)}$   $9 \times 10^6$ . The results indicate that the best magnetic properties are obtained for alloys near the 50 at. % composition.

#### Magnetostriction Measurements on some Ordered and Disordered Iron-Platinum Alloys

E. KLOKHOLM and F. J. DONAHOE, Conference on Magnetism and Magnetic Materials, A.I.E.E., 1957, Feb., 268-271

The measurements were carried out on alloys containing 24.2, 27.1 and 30.0 at. % Pt. The disordered 24.2 and 27.1 alloys show a decrease in magnetostriction with decreasing temperature,

assumed to be due to the  $\gamma - \alpha$  phase transformation. The ordered alloys show an increase on decreasing the temperature, but on returning to room temperature from 80°K the decrease is 25% greater than expected. Both room temperature and 80°K values are higher than in the disordered state. The 30% alloy has the same magnetostriction in the ordered and disordered states at room temperature, but the 80°K value is higher for the ordered alloy.

## ELECTROCHEMISTRY

#### A New Method of Titrimetry with the Help of Polarised Platinum Electrodes

W. WALISCH, *Chim. analyt.*, 1957, 39, (2), 63-66  
A new method of electro-titrimetry given the name "polarovoltric" is described. It is based on a circuit with a very high resistance of 0.3-0.5 megohms and uses polarised Pt electrodes. The complete apparatus includes a voltage change indicator connected to a relay which controls an automatic burette. It can be used in acidimetric, oxidation, precipitation and complexing reactions and also in slower organic reactions.

#### The Potentials of Metallic Electrodes in Pure Water

W. TOMASSI and A. HOUWALT, *Przem. Chem.*, 1957, 36, (2), 82-87 (English Summary)  
Measurements were carried out on Hg, Pt black and smooth Pt electrodes in very pure water. The results indicate oxidation of electrodes even in air-free water, confirming the work of previous authors.

#### Hydrogen Evolution Reaction on Copper, Gold, Molybdenum, Palladium, Rhodium and Iron. Mechanism and Measurement Technique under High Purity Conditions

N. PENTLAND, J. O'M. BOCKRIS and E. SHELDON, *J. Electrochem. Soc.*, 1957, 104, (3), 182-194

The kinetics of the hydrogen evolution reaction in acid and alkaline solutions were examined with special reference to the low current density region. Full experimental details are given. It was found that, in general, the rate determining step is electrochemical desorption in acid and discharge of protons in alkaline solution.

#### Investigation of the Oxygen Coating on Noble Metal Electrodes by Means of Impedance Measurements and Cathodic Charge Curves

I. SMOOTH PLATINUM ELECTRODES  
M. BECKER and M. BREITER, *Z. Elektrochem.*, 1956, 60, (9/10), 1080-1089

The results indicate that the composition of the ionic double layer is strongly influenced by adsorption of oxygen. On the basis of a roughness factor of 1.5 it is calculated that for a reference potential  $U = 1.4$  v a single layer of oxygen atoms exists and for  $U = 2.1$  v, in the region of oxygen generation, the layer is two atoms thick.

## LABORATORY APPARATUS AND TECHNIQUE

### A High Temperature Microfurnace for the Study of the Devitrification of Glass

H. BRIDGE, *J. Sci. Instruments*, 1957, **34**, (4), 136-139

Pt is used in the construction of the furnace to reduce its thermal capacity. It can be operated up to 1200°C, the temperature of the specimen being measured by a Pt:Rh-Pt thermocouple. The furnace is designed primarily for the study of crystal growth and phase diagram determination and incorporates an optical system and photographic recording apparatus.

### The Potential of the Adsorption Micro-electrode in Air Contaminated by Oxidising Gases

B. KAMIENSKI and J. KULAWIK, *Bull. Acad. Polonaise Sci.*, 1957, **5**, (1), 79-82 (In English)

The potential of a Pt wire micro-electrode was measured in the presence of O<sub>2</sub>, H<sub>2</sub> and NO<sub>2</sub>. O<sub>2</sub> has a strong influence on the potential of the electrode. The effect of H<sub>2</sub> was found to be greater when no oxygen was present. The change in potential caused by NO<sub>2</sub> is reversible (i.e. can be removed by flushing with clean air) provided the concentration of NO<sub>2</sub> in the atmosphere is <0.1%.

## CATALYSIS

### Ultraforming to 100 Octane Number Clear

W. F. JOHNSTON, W. J. MONTGOMERY and P. C. WHITE, *Petroleum Eng.*, 1957, **29**, (2), C-44

A description of American Oil Company's Texas City Ultraformer, which produces 100 octane number clear gasoline. The Ultraforming process achieves a superior yield-octane ratio by operating at low pressures, about 300 p.s.i.g., and using a highly selective Pt:Al<sub>2</sub>O<sub>3</sub> catalyst. At this pressure carbon is deposited on the catalyst, but its activity is maintained by cyclic regeneration of the reactors. Five of the six reactors are in operation at a time and the other is being regenerated. A desulphurised feed is used to reduce corrosion.

### Catalytic Reforming and Dehydrogenation

H. HEINEMANN and H. SHALIT, *World Petroleum*, 1957, **28**, (2), 56-62

A review of U.S. patents issued between May and November, 1956

### A New Palladium Catalyst for the Dehydrogenation of Cyclohexanes

N. I. CHOUKINE and Kh. M. MINATCHEV, *Rev. Inst. Franc. Petrole*, 1956, **11**, (12), 1611-1615

A review of work, mainly Russian, is given. A particularly active catalyst contains 0.5% Pd on Al<sub>2</sub>O<sub>3</sub>. The Al<sub>2</sub>O<sub>3</sub> was treated with a dilute HF solution before being impregnated with PdCl<sub>2</sub> solution, dried and treated with H<sub>2</sub>S, this

catalyst dehydrogenated cyclohexane at 450° giving a 93.4% yield. Its stability was tested in dehydrogenating a petroleum fraction containing 7.5% aromatics and 0.0025% sulphur at 450° under a hydrogen pressure of 20 atmospheres. No change in activity was found in 262 hours' working and the aromatic content of the fraction was increased to 36-40%. The sulphur content does not poison the catalyst under these conditions, neither is any cracking of hydrocarbons observed.

### Radiation Quenching, Ion-Bombardment and Annealing of Nickel and Platinum for Ethylene Hydrogenation

H. E. FARNSWORTH and R. F. WOODCOCK, *Indust. & Eng. Chem.*, 1957, **49**, (2), 258-260

Ni and Pt samples were cleaned by a combination of heating, radiation quenching, ion-bombardment and annealing in a high vacuum system. Ni radiation quenched from 850°C and Pt from 1200°C are both three times more active than after subsequent annealing at 500 and 700°C respectively. After argon-ion-bombardment Ni is a hundred and Pt ten times as active as after annealing. This high activity may be caused by surface lattice-defects which are largely removed by the subsequent annealing.

### Carbon Monoxide-Steam Reaction on Ruthenium Catalysts

G. PARRAVANO, *Indust. & Eng. Chem.*, 1957, **49**, (2), 266-271

The activities of the catalysts Ru black, and 0.5% Ru on ThO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> were measured. The reaction was studied in a flow-system at atmospheric pressure, 750°C and a gas flow of 0.9 ml./min. of CO, 3.48 of H<sub>2</sub>O and 15% He (diluent). Grain size and composition of the support have no effect on the activity, but Ru-SiO<sub>2</sub> and pre-heated Ru-Al<sub>2</sub>O<sub>3</sub> result in higher activation energies. The adsorption of CO is the rate controlling step in the reaction. The kinetics of the reaction over Fe and Ru catalysts are similar.

### The Catalytic Oxidation of Vitamin A with Oxygen and Platinum to Vitamin-A-aldehyde (a new method)

P. KARRER and W. HESS, *Helv. Chim. Acta*, 1957, **40**, (2), 265-266

The oxidation was carried out in acetic acid at room temperature in an oxygen atmosphere using PtO<sub>2</sub> as catalyst. It was complete within 6½ hours and the aldehyde could easily be isolated from the solution.

### The Addition of Silicon Hydrides to Olefinic Double Bonds Part II. The Use of Group VIII Metal Catalysts

J. L. SPEIER, J. A. WEBSTER and G. H. BARNES, *J. Amer. Chem. Soc.*, 1957, **79**, (4), 974-979

The catalysts used include H<sub>2</sub>PtCl<sub>6</sub>, K<sub>2</sub>PtCl<sub>4</sub>, Pt black, Pt<sub>2</sub>C, IrCl<sub>3</sub> and RuCl<sub>3</sub>. The addition

reaction is exothermic and in many cases very rapid from below room temperature to about 100°C. The reaction between methylchlorosilane and pentene-1 or pentene-2 takes place over all the catalysts giving n-pentylsilanes, but cyclohexene only reacts over H<sub>2</sub>PtCl<sub>6</sub>. The H<sub>2</sub>PtCl<sub>6</sub>, Pt black and RuCl<sub>3</sub> catalysts are used to prepare adducts between other silicon hydrides and olefins.

### Catalysis on Metals of Group VIII

J. ADDY and G. C. BOND, *Trans. Faraday Soc.*, 1957, **53**, (3)

#### Part 1. The Reaction of Cyclopropane and Propane with Deuterium over a Palladium Catalyst pp. 368-376

The reactions were carried out on a 5% Pd-pumice catalyst between 50 and 200°C. Deuterium and cyclopropane form deuteropropanes containing about 80% propane-d<sub>7</sub> and d<sub>8</sub>. This distribution is not altered by changing the initial reactant ratio or the temperature. The exchange reaction between deuterium and propane gives an unsymmetrical distribution of deuteropropanes similar to that from cyclopropane, but in this case it is temperature dependent. The initial reaction mechanisms are thought to be similar. The unsymmetrical distribution arises from reactions on different crystal faces of the catalyst.

#### Part 2. The Reaction of Deuterium with Propylene and Propyl Chlorides over a Palladium Catalyst pp. 377-382

The reactions were carried out on 5% Pd-pumice catalyst. The propylene-deuterium reaction was studied at 50°C using D<sub>2</sub>/C<sub>3</sub>H<sub>6</sub> ratios from 1-26. The most abundant propane is the lightest species (d<sub>0</sub>), but deuteropropanes are formed in greater amounts as D<sub>2</sub>/C<sub>3</sub>H<sub>6</sub> increases, at the same time the yields decrease. Both *n* and *iso* propyl chlorides are reduced slowly to deuteropropanes. The distributions obtained resemble those from cyclopropane rather than from propane. The marked differences in deuteropropane distributions from cyclopropane and propylene are explained by their relative strengths of adsorption: propylene >H<sub>2</sub> >cyclopropane. The relative rates of olefin exchange are much greater over Pd than over Pt. The behaviour of Pd and Pt in olefin-deuterium exchange reactions is compared with that of other transition metals.

#### Part 3. The Reaction of Cyclopropane and Propane with Deuterium over Rhodium and Iridium Catalysts pp. 383-387

The reactions were studied over 5% Rh-pumice from 0-200°C for cyclopropane and 50-200°C for propane. The distributions of deuteropropanes are very similar to those obtained with Pd. Over the 5% Ir-pumice catalyst the cyclopropane reaction was studied from 15-100°C and the propane reaction from 100-200°C. The Ir catalyst has a very high activity. The deuterio-

propane distributions are slightly temperature dependent for both reactions.

#### Part 4. The Reaction of Cyclopropane and Propane with Deuterium over a Platinum Catalyst pp. 388-392

The reactions were studied over a 5% Pt-pumice catalyst, the cyclopropane between 50 and 200°C and the propane between 100 and 250°C. The results compare well with those from previous studies, in both cases the distribution of deuteropropanes is temperature dependent. A brief comparative discussion of the behaviour of Pd, Rh, Pt and Ir is given. Metals with the greatest d-bond character, Rh and Ir, are most active. Efficiency in multiple exchange increases with catalytic activity for hydrogenation-type reactions. In Group VIII metals horizontal relationships are more marked than vertical ones.

#### The Surface State of Catalyst Particles

S. YAMAGUCHI and T. TAKEUCHI, *Kolloid-Z.*, 1957, **150**, (1), 69-71

Electron diffraction studies of Pt powder, ZnO dust and a Cu catalyst containing NiO as promoter were carried out. The Pt powder had an amorphous surface, the ZnO dust was crystalline and the Cu catalyst had particles of NiO distributed on its surface. In the Pt catalyst the deviation of the surface state from that of the interior was considered to be a measure of the activity of the catalyst.

#### Naphtha Processing over Platforming Catalyst. Effect of Sulphur on Catalyst Life

W. K. MEERBOTT, A. H. CHERRY, J. N. UMBACH and B. W. ARNOLD, *Indust. and Eng. Chem.*, 1957, **49**, (4), 650-655

Experiments were carried out with U.O.P. type R-5 spherical Platforming catalyst using feedstock containing 0.01 (desulphurised), 0.07 and 0.17 wt. % sulphur. Good catalyst life can be expected with up to 0.07% sulphur but with 0.17% the decline in activity is outside the tolerable limit. At this sulphur content the rate of decline increases and the yield of Platformate decreases with catalyst age. The effect of altering the pressure from 650-600 p.s.i.g. to 500-450 p.s.i.g. has little effect on the yield. It is shown that the catalyst activity is affected much less by carbon deposition than by the presence of sulphur.

#### The Chemisorption of Oxygen and Hydrogen on Platinum

T. J. GRAY and C. C. MCCAIN, *Proc. 2nd Intern. Congress Surface Activity*, 1957, (3), 158-166 (Preprint)

The chemisorption was studied by determining the magnetic susceptibility and correlating this with measurements of the amount of gas adsorbed. The measurements were made on Pt gauze, foil and powder, in vacuo and in atmospheres of H<sub>2</sub> and O<sub>2</sub>, between 0 and 800°C. The susceptibility

is reduced in an oxygen atmosphere. The effect of hydrogen depends on the previous treatment of the sample. It has no effect on a clean surface, but it restores to normal the susceptibility of one which has been oxidised. In the case of Pt gauze this final value is actually higher than the original due to impurity effects. The theoretical implications of the electronic state of the surface and the adsorbed species are considered in detail. The results suggest the formation on Pt of a non-stoichiometric oxide of such constitution that extensive modification of the d-band electrons occurs.

#### The Reactions of Alkanes with Deuterium on Palladium- $\gamma$ -Alumina Catalyst

B. K. CHONG SHIM, *Diss. Abs.*, 1956, **16**, 2325-2326  
The reactions were studied between 40 and 170°C in a flow system at atmospheric pressure. It was found that cyclic hydrocarbons exchanged 3-5 times faster than heptane and hexane. In general the exchange patterns on Pd favour the formation of perdeutero species. The mechanism of exchange in the compounds studied is outlined.

## ELECTRICAL ENGINEERING

#### Short Duration Discharges between Separating Contacts in a 6 V Circuit

J. RIDDLSTONE, *Brit. J. Appl. Physics*, 1957, **8**, (3), 105-108

Measurements were carried out using the Electrical Research Association ultra high-speed oscillograph. The contacts used were of Pt, Pd and Ag. The closed circuit currents were 4.5 and 8 A for Pt and 4.5 A for Pd, the circuit inductance ranging from 0.07 to 4.7  $\mu$ H. Representative records and a tabular analysis of their important characteristics are given. Discharges occur under all conditions covered in the experiments, their durations varying from about 0.01 to 1.0  $\mu$ s. Voltages are low, in some cases as low as 7 V, but usually lying between 10 and 18 V. Graphs showing the variation of material

transfer with inductance are given. It is shown that there is not yet sufficient evidence on which to base a theory of the arc at separation or a relationship between transfer and arc characteristics.

#### Breakdown Fields of Activated Electrical Contacts

F. E. HAWORTH, *J. Appl. Physics*, 1957, **28**, (3), 381  
Experiments were carried out on Pd relay contacts operating in an atmosphere containing 1 mm vapour pressure of *d*-limonene, to determine the electric field at gaseous breakdown of the gap when discharge is initiated during closure. An apparent decrease in this field with operating time is observed. This is explained by "activation" of the contacts due to carbon deposition which effectively shortens the gap on closing the contacts and widens it on opening when some of the carbon is burnt off.

## ELECTRONICS AND TELECOMMUNICATIONS

#### Electron Tubes for the Transatlantic Cable System

J. O. MCNALLY, G. H. METSON, E. A. VEAZIE and M. F. HOLMES, *Communication and Electronics (A.I.E.E. Trans.)*, 1957, Jan., 898-907 (also in: *P.O. Elect. Eng. J.*, 1957, Jan., and *Bell System Tech. J.*, 1957, Jan.)

The repeaters in the Newfoundland to Scotland section contain the 175HQ valve developed by the Bell Telephone Laboratories, while those in the Nova Scotia to Newfoundland section contain the British Post Office Research Station's 6P12 valve. Some development problems are discussed in relation to the long life required. A major change in the design of the 6P12 valve was the replacement of the conventional Ni cathode core by high purity Pt to reduce transconductance decay. Electrical characteristics for the two valves and life-test data are given. Fabrication and selection problems are outlined and reliability prospects discussed.

## NEW PATENTS

#### Forming Metallic Patterns

ELECTRIC & MUSICAL INDUSTRIES LTD. *British Patent* 768,548

In the manufacture, for example, of a target electrode for a television pick-up tube, a support is first coated through a stencil with a layer of a first metal, e.g. silver, and a layer of a different metal, e.g. platinum, is then applied to the surface. The layers are then treated with a substance which reacts with the first metal to reduce its adhesion, thus enabling the silver and the portions of the platinum layer thereon to be removed, leaving a pattern of platinum metal corresponding with the stencil.

#### Isomerisation of Alkylated Benzenes

THE ATLANTIC REFINING CO. *British Patent* 768,721  
A catalyst composed of platinum or palladium supported on silica-alumina, silica-magnesia, silica-thoria or silica-zirconia is used in a process of isomerising alkylated benzenes in the presence of excess hydrogen and under dehydrogenation-isomerisation conditions.

#### Production of Hydrogen Peroxide

ALLIED CHEMICAL & DYE CORP. *British Patent* 768,814

A supported palladium catalyst, e.g. palladium-activated carbon, is used in a process for the