

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

manufacture of hydrogen peroxide by the successive reduction and re-oxidation of an alkylated anthraquinone, which is dissolved in a solvent consisting of an aromatic hydrocarbon, an aliphatic alcohol and a ketone, e.g. acetophenone or benzophenone.

#### **Semi-Conductor Devices**

LES APPLICATIONS ELECTRONIQUES DES CAOUTCHOUCS. *British Patent 769,199*

An electrode covered with a film of rhodium forms part of a semi-conductor device of variable resistance.

#### **Hydroxylation of Unsaturated Fatty Acids**

KESSLER CHEMICAL CO. INC. *British Patent 769,200*

An electrolytic cell having an anode of platinum and a cathode of lead is used in a process of converting unsaturated fatty materials to polyhydroxy compounds.

#### **Hydrogenated Liquid Polymer Oils**

ESSO RESEARCH & ENGINEERING CO. *British Patent 769,281*

A platinum-on-charcoal or -silica gel catalyst is employed as hydrogenation catalyst in the preparation of improved liquid oily polymers.

#### **Production of Hydroaromatic Hydrocarbons**

THE COAL TAR RESEARCH ASSOCIATION. *British Patent 769,293*

A supported or unsupported platinum hydrogenation catalyst is used in the second stage of a two-stage process of hydrogenation of coal tar or coal tar fractions.

#### **Hydrogenation of Crude Hydrocarbon Oils**

ESSO RESEARCH & ENGINEERING CO. *British Patent 769,346*

A platinum-on-alumina (0.5 wt. % Pt. and 99.5 wt. %  $Al_2O_3$ ) catalyst is used as a hydrogenation catalyst in a process of producing gas oil from crude oil by contacting the crude oil in liquid phase with hydrogen-containing gas in the presence of the catalyst under destructive hydrogenation conditions.

#### **Glass Furnaces**

D. G. HANN. *British Patent 769,428*

That part of the supporting stem of an electrode element immersed in the melt in a glass melting furnace is sheathed in a tubular member closed by a cap at its outer end so as to enclose this part of the stem completely from the atmosphere both outside and inside the furnace chamber. The tubular member and the cap may be formed of platinum.

#### **Production of Hydrogen Peroxide**

OLIN MATHIESON CHEMICAL CORP. *British Patent 769,514*

A platinum- or palladium-on-alumina catalyst in particle form is used in a process of producing hydrogen peroxide from an alkyl anthraquinone by successive reduction and oxidation.

#### **Production of Hydrogen Peroxide**

OLIN MATHIESON CHEMICAL CORP. *British Patent 769,515*

Similar subject matter to No. 769,514.

#### **Applying Conducting Films on Insulating Backings**

ASSOCIATED ELECTRICAL INDUSTRIES LTD. *British Patent 769,697*

Receptacles of platinum or platinum-lined molybdenum are used as containers for coating materials, i.e. metal oxides and gold to be evaporated on to a transparent insulating backing to form an electrically conducting optically transparent coating thereon.

#### **Electrical Resistors**

WELWYN ELECTRICAL LABORATORIES LTD. *British Patent 770,175*

The contact resistance of an electrical resistor of the kind produced by subjecting to reducing conditions a material containing titanium dioxide is reduced by applying, e.g. at each end, a fired layer of gold, platinum, palladium, iridium, rhodium or osmium or an alloy of two of them, e.g. a gold-platinum alloy of a thickness of 0.0001-0.001 mm. The layers may be applied by means of solutions of resinates, sulphoresinates, or alginates of the metals.

#### **Vaporisation of Metals**

W. EDWARDS & CO. LTD. *et al. British Patent 770,752*

In an apparatus suitable for vaporising, inter alia, platinum or palladium, the surface from which the metal is to be vaporised consists of a sintered refractory composition composed of silicon carbide and a boron-carbon substance, the composition containing 0.4-25% of boron.

#### **Production of Amines**

IMPERIAL CHEMICAL INDUSTRIES LTD. *British Patent 771,063*

A platinum or platinum oxide catalyst, preferably supported on an inert carrier, such as charcoal, is used as a hydrogenation catalyst in a hydrogenating step in the production of amines of specified general structure.

#### **Hydroforming of Petroleum Hydrocarbons**

ESSO RESEARCH & ENGINEERING CO. *British Patent 771,313*

A naphtha fraction is subjected to a hydro-forming reaction in the presence of a platinum- or palladium-on-alumina catalyst under conditions such that the catalyst requires regeneration after at most 48 hours, a pressure of 50-250 lb. sq.in. being employed for the reaction. The reaction is interrupted periodically when regeneration is necessary and the catalyst is regenerated with a free-oxygen containing gas before resumption of the hydroforming reaction.

## Crematorium Furnaces

GIBBONS ASKAM LTD. *British Patent 771,919*  
A catalyst composed of finely divided platinum, osmium or iridium or mixtures thereof supported on a porous refractory base, e.g. unglazed porcelain, is used in a crematorium furnace for the purpose of effecting complete oxidation of gas or smoke emitted during combustion of human remains.

## Preparation of 1,4-Unsymmetrically Substituted Piperazines

AMERICAN CYANAMID CO. *British Patent 772,147*  
A reducing catalyst comprising palladium-on-charcoal is used in a method of preparing 1,4-unsymmetrically substituted piperazines by treating 1-carbamyl-4-carbobenzoxy piperazine with hydrogen and the catalyst.

## Reforming of Gasoline or Gasoline Fractions

N. V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ  
*British Patent 772,407*

In the reforming of gasoline or gasoline fractions, decrease in the activity of the supported platinum catalyst, e.g. a platinum-alumina-halogen catalyst, is reduced by a conditioning treatment consisting of treatment at 300-550°C with hydrogen containing a small amount of hydrogen sulphide or a sulphur compound yielding hydrogen sulphide under the prevailing conditions.

## Preparation of Hydroxylamine

SPENCER CHEMICAL CO. *British Patent 772,670*  
A hydroxylamine salt is prepared by reducing aqueous nitric acid with hydrogen in the presence of a rhodium catalyst supported on an acid insoluble carrier, e.g. activated carbon, charcoal, alumina or silica gel. 5% rhodium on active carbon is preferred.

## Preparation of Hydroxylamine

SPENCER CHEMICAL CO. *British Patent 772,831*  
In the production of a hydroxylamine salt, nitric acid is hydrogenated in an aqueous or aqueous methanol medium at atmospheric or super-atmospheric pressure in the presence of a catalyst composed of palladium or platinum or their oxides supported on an acid insoluble carrier, e.g. activated carbon, charcoal, alumina, quartz or silica gel.

## Production of Hydroxylamine

SPENCER CHEMICAL CO. *British Patent 772,832*  
Hydroxylamine is produced by reducing aqueous nitric acid with hydrogen in the presence of a catalyst of rhodium supported on activated carbon, alumina, silica gel, etc., the reaction mixture containing up to 0.03 gm of copper per mole of nitric acid.

## Preparation of Unsaturated Cyclic Hydrocarbons

THE BRITISH OXYGEN CO. LTD. *British Patent 773,225*

A compound of platinum, e.g. platinum chloride, is used as a catalyst in a method of producing cyclo-octatrienes by reduction of cyclo-octatetraene with a reducing agent, e.g. zinc dust in conjunction with a solution of an alkali or of a mineral acid in water at 20-120°C.

## Morphine Alkaloids

MERCK & CO. INC. *British Patent 773,467*  
Codeinone and neopine are prepared by treating 14-bromo-codeinone with hydrogen in the presence of a hydrogenation catalyst, and a neutral solvent to produce neopinone. The catalyst used is a platinum group metal catalyst, preferably palladium supported on charcoal or barium sulphate.  $\frac{1}{4}$ -10% by weight, based on weight of the 14 bromo-codeinone, of catalyst is used.

## Hydroforming

ESSO RESEARCH & ENGINEERING CO. *British Patent 773,476*

In a multi-stage process for the hydroforming of naphthas in the presence of a platinum group metal catalyst, the activity of the catalyst is maintained by adding halogen, e.g. chlorine, or a halogen-containing compound to the feed passing each stage after the first. A platinum-on-alumina catalyst is preferably employed.

## Polymerisation of Ethylene

K. ZIEGLER. *British Patent 773,536*  
Ethylene is polymerised to form butene, hexene or higher liquid polymers in the presence of an aluminium trialkyl of specified general formula, which may be activated by platinum, by adding a suitable compound of the metal to the aluminium trialkyl catalyst itself.

## Heating Shell for Chemical Laboratory Apparatus

W. C. HERAEUS G.M.B.H. *German Patent 953,292*  
A heating shell for chemical laboratory apparatus comprises a hollow cylindrical heating retort of glass or the like, the wall of which is provided with electrically heatable resistance coatings, spaced sufficiently from one another to allow of viewing of the interior of the device. The coatings may consist of fired on strips of platinum or platinum alloys.

## Manufacture of Contacts

E. DÜRRWÄCHTER *et al.* *German Patent 954,984*  
In order to reduce the initial tendency of contacts of noble metal, such as platinum or other platinum group metal or alloy, to arcing, the surface of the contact is subjected to a high frequency electric

spark discharge of 5,000-20,000 volts at frequency of  $10^5$ - $10^8$  Hertz for a period of about 30 sec/cm<sup>2</sup>, in an oxidising atmosphere.

### Electric Contacts

W. C. HERAEUS G.M.B.H. *German Patent 959,061*  
An alloy composed of 30-70%, preferably 50-70%, iridium, rhodium and/or ruthenium and remainder tungsten is used as a material for electric contacts. If desired, up to 80% of the iridium, rhodium and/or ruthenium may be replaced by platinum. The disadvantage inherent in tungsten contacts of oxide formation is avoided and a long operating life ensured.

### Platinum-Alumina Catalyst

ESSO RESEARCH & ENGINEERING CO. *U.S. Patent 2,776,264*

A hydrocarbon conversion catalyst is made by mixing a solution of platinum-containing compound with gamma alumina and heating the mixture to 600-1,600°F to dry the mixture. The gamma-alumina is derived from alumina alpha monohydrate, which has been obtained by reacting aluminium with an aliphatic alcohol to form an alcoholate and contacting the latter with water vapour to hydrolyse the alcoholate to alumina alpha monohydrate.

### Rosin Hydrogenation

HERCULES POWDER CO. *U.S. Patent 2,776,276*

A platinum, rhodium or ruthenium catalyst is used in hydrogenation of rosin acids, esters of rosin acids, alcohols produced by reduction of the carboxylic group of a rosin acid or esters of such alcohols at a temperature of 125-300°C and a pressure of at least 3,000 p.s.i.g.

### Catalytic Reactions

THE M. W. KELLOGG CO. *U.S. Patent 2,777,805*

A catalyst for use in reforming a naphtha fraction is made by combining a platinum or palladium compound, a silicon compound (in amount to provide 0.5-15% by weight of silica in the finished catalyst) and an auxiliary carrier material and treating the mixture to obtain platinum or palladium supported on silica and the auxiliary carrier.

### Removal of Arsenic in Hydrocarbon Oils

UNIVERSAL OIL PRODUCTS CO. *U.S. Patent 2,778,779*

Reformed gasoline is produced from an arsenic-containing hydrocarbon charge by treatment with a readily reducible oxide and water and separation therefrom of a gasoline fraction of arsenic content less than 0.015 part per million, which is then reformed in the presence of a platinum-alumina catalyst.

### Removing Arsenic from a Hydrocarbon Feed Oil

UNIVERSAL OIL PRODUCTS CO. *U.S. Patent 2,779,715*

Gasoline from an arsenic-containing hydrocarbon charge is treated with the hydroxide, oxide or salt of an alkali metal and an alkaline earth metal, a gasoline fraction having an arsenic content less than 0.015 part per million and less than that of the charge is separated therefrom and reformed in the presence of a platinum-alumina catalyst.

### Reductive Alkylation Process

UNIVERSAL OIL PRODUCTS CO. *U.S. Patent 2,779,789*

The reductive alkylation of a compound having amino or nitro group substituent with a carbonyl compound (ketone or aldehyde) is effected with hydrogen in the presence of a platinum catalyst containing not over 2% by weight of platinum and which has been pretreated with hydrogen and/or hydrocarbon at above 200°F.

### High Resistivity Alloy

BAKER & CO. INC. *U.S. Patent 2,780,543*

A high resistance alloy is composed of 20-62% palladium, 4-18% iron and 28-70% gold.

### Platinum and/or Palladium Catalysts

THE M. W. KELLOGG CO. *U.S. Patent 2,780,603*

A catalyst is prepared by combining a fresh alumina material with a permanently deactivated platinum- or palladium-on-alumina catalyst element in the ratio of 0.1-10 parts of alumina to 1 part of catalyst.

### Platinum Catalyst

UNIVERSAL OIL PRODUCTS CO. *U.S. Patent 2,781,323*

A catalyst is made by compositing a halogen component with an inorganic refractory oxide, calcining the composite at 400-1,600°F, submerging the product in water to distribute the halogen uniformly and then adding a Group VIII metal.

### Making Platinum Reforming Catalyst

UNIVERSAL OIL PRODUCTS CO. *U.S. Patent 2,781,324*

Alumina is commingled with a platinum compound-ammonium hydroxide solution and an oxidising agent in amount to form a catalyst containing 0.01-1% by weight of platinum.

### Polymerisation of Ethylene

K. ZIEGLER *et al.* *U.S. Patent 2,781,410*

Ethylene is polymerised into polymers ranging from butene to solid polymers by contact at 50-250°C with an aluminium trialkyl catalyst activated with platinum.