

ABSTRACTS

of current literature on the platinum metals and their alloys

PROPERTIES

The Magnetic Susceptibilities of Palladium-Uranium Alloys

L. F. BATES and S. J. LEACH, *Proc. Phys. Soc.*, 1956, **69B**, (II), 997-1005

Measurements are made of the paramagnetic susceptibilities of the solid solution range (0-21 at. % U), the intermetallic compound Pd₃U and specimens of very pure Pd and U. Results show a decrease in susceptibility with U content up to 9 at. % U, followed by a rapid increase. The temperature dependence of the susceptibility is investigated and it is found that above 12 at. % U the alloys obey a Curie-Weiss law, this being explained by a change in the valency of the U. The results are discussed in relation to the Pd-Ag system.

Quenching Vacancies in Platinum

F. J. BRADSHAW and S. PEARSON, *Phil. Mag.*, 1956, **1**, Sept., 812-820

The electrical resistance of Pt wires was measured in liquid nitrogen before and after heating to high temperatures and quenching to room temperatures. It was found that the resistance after quenching was greater than the original value but that the increase could be removed by annealing at temperatures in the region of 400°C. This annealable increase is interpreted as being due to lattice vacancies. From theoretical considerations the activation energies for movement and formation of a single vacancy are deduced from the annealing results.

The Effect of Prior Extension on the Annealing Rate of Lattice Vacancies in Platinum

F. J. BRADSHAW and S. PEARSON, *Phil. Mag.*, 1956, **1**, Sept., 880-882

Pt wires, after conditioning at 1700°C and quenching, were extended up to 9.2% of their length and it was found, as was expected, that this extension increased the rate at which the vacancies annealed out. A graph of the ratio of annealing rates against the % extension from 0-9.2 shows that after an initial steep rise the annealing ratio increases approximately linearly with extension.

Measurement of the Hall Effect in Diamagnetic Palladium Alloys

J. COHEN, *Compt. rend.*, 1956, **243**, (16), 1105-1107

The Hall effect was measured for alloys of Pd

with Ag, Re and Ti. The results obtained together with electrical resistivity measurements for the Pd-Ag system indicate that some magnetic coupling of electrons occurs in these alloys.

Contribution to the Experimental Study of Interactions of the Molecular Field Type. Solid Solutions of a Ferromagnetic and Antiferromagnetic Metal in Palladium

J. COHEN, *Compt. rend.*, 1956, **243**, (21) 1613-1616

Values of the Curie temperature and the molecular Curie constant were determined for alloys of up to 20% Ni and Cr in Pd. In the Pd-Ni system the Curie temperature changes from negative to positive at about 4% Ni whereas in the Pd-Cr system it becomes increasingly negative thus showing in each of the systems a tendency to adopt the properties of the ferromagnetic Ni and antiferromagnetic Cr respectively, even at low concentrations.

A Magnetic Study of the Ternary Alloy System Palladium-Nickel-Copper

J. COHEN, *Compt. rend.*, 1956, **243**, (23), 1845-1847

Thermomagnetic studies were carried out on ternary alloys Pd-Ni-Cu. Starting from a Ni-Pd alloy containing 6.9% Ni four ternary alloys were prepared containing up to 18.7% Cu. In the temperature range investigated, 0-800°C, the magnetic susceptibilities obeyed the Curie-Weiss law. The Curie temperature fell from +127° K for the Ni-Pd alloy to -100° K for the alloy containing 18.7% Cu, and the Curie constant varied from 246 to 160. A theoretical interpretation of the results is attempted.

Measurement of the Atomic Heat of Pure and Hydrogen-containing Palladium

W. EICHENAUER and L. SCHAFFER, *Z. Naturforschung*, 1956, **11a**, Nov., 955-956

It was found that the atomic heats of Pd containing 11.8 and 16.3 at. % of hydrogen are higher than for pure Pd. This result is discussed in relation to phase-transformations in the Pd-H system.

The Thermal and Electrical Conductivities of Metals at High Temperatures

M. R. HOPKINS, *Z. Physik*, 1957, **147**, (2), 148-160 (In English)

A method of investigating electrical and thermal conductivities of metals at very high temperatures is described. The ratio of thermal to electrical

conductivity of Pt is determined from 1200° C to the melting point and from the melting point to 2300° C by making simultaneous observations of electrical potential and maximum temperature in a short wire through which current is passed. Details of the arrangement of the apparatus and of the method of temperature measurement are given.

Phase Transformations in Iron-Platinum Alloys near the Composition Fe₃Pt

A. E. BERKOWITZ, F. J. DONAHOE, A. D. FRANKLIN and R. P. STEIJN, *Acta Met.*, 1957, 5, Jan., 1-12

The kinetics of the ordering processes in Fe-Pt alloys near the composition Fe₃Pt were studied in the temperature range 450-750° C by means of resistivity measurements and Curie point determinations on polycrystalline wires. Quenched alloys containing less Pt than stoichiometric FePt consist of a mixed face-centered γ and body-centered α phase. Information was obtained regarding the order-disorder transformation in the γ phase alloys and the α - γ phase transformation, and as a result of these investigations some slight changes in the phase-diagram of the system are suggested.

Magnetic Study of Hydrogenated Palladium-Nickel and Palladium-Cobalt Alloys

J. COHEN and J. WUCHER, *Compt. rend.*, 1957, 244, (1), 49-51

A preliminary investigation of the effect of dissolved hydrogen on the magnetic properties of the alloys Pd-Ni and Pd-Co. It is found that for the alloy Pd-10%Ni the magnetic susceptibility decreases linearly as the amount of dissolved hydrogen increases, and that for Pd-2.5%Co at low temperatures the Curie temperature remains constant although the magnetic susceptibility and moment become very small as the alloy is saturated with hydrogen.

Sign Reversal of the Hall Effect in Rhodium

B. R. COLES and J. C. TAYLOR, *J. Phys. Chem. Solids*, 1957, 1, Jan., 270-274

Measurements of the Hall effect in Rh were made at temperatures between 4.2° K and 300° K in fields up to 22 kilogauss. The results can be fitted quite closely by theoretical models adapted to the electronic structure of Rh.

X-ray Measurements of Order in the Cobalt-Platinum System

P. S. RUDMAN and B. L. AVERBACH, U.S. Atomic Energy Comm., Report NYO-7051

The long-range order in the alloy Co-Pt is measured by means of X-ray intensity and lattice tetragonality measurements on powder briquettes

quenched from various annealing temperatures. The long-range order vanishes discontinuously from a value of $Sc=0.78$ on heating above the critical temperature, $T_c=833 \pm 2^\circ$ C. Local order and size effect coefficients are also obtained for a series of Co-Pt alloys by means of diffuse scattering measurements from powder briquettes quenched from the disordered phase. Short range order coefficients (i.e. a preference for unlike neighbours) of the same magnitude as those found in the Au-Cu system and size coefficients similar to those found in the Au-Ni system are observed.

Investigation of Wrought Iron-Chromium-Aluminium Alloys Containing Platinum and Palladium

H. A. SALLER, J. T. STACY, S. W. POREMBKA, U.S. Atomic Energy Comm., Report BMI-1017

The effect of up to 15% Pt and 20% Pd in increasing the strength of an Fe-25%Cr-5%Al alloy at 1800-2200° F without damaging its oxidation resistance is investigated. The alloys were arc melted under a partial pressure of helium and cast. Those containing Pt are very susceptible to cracking on cooling after melting and can only be rolled with difficulty, while the addition of more than 10% Pt causes a rapid decrease in oxidation resistance at 2200° F. The Pd alloys can be easily melted and cast without cracking and the 10% alloy can be rolled between 1800 and 2350° F with best results at 2200°. Additions of up to 15% Pd slightly improve the oxidation resistance of the ternary alloy at 2200° F, with a 10% addition giving the best result.

In short-time stress-rupture tests the alloys containing Pt are superior to alloys with corresponding amounts of Pd at 1800° but at 2200° the reverse is true. At 1800° 15% Pt increases the strength of the base ternary alloy to over twice its original strength, while at 2200° the 10% Pd alloy has a strength three times greater than the original. The quaternary alloy containing 10% Pd has the best overall properties and was further tested for creep-rupture characteristics. Results show that this alloy has a 100 hr. rupture strength of 800 and 300 lb./sq. in. at 1800 and 2200° respectively, the strength at 2200° being triple that of the Fe-Cr-Al alloys without Pd.

ELECTROCHEMISTRY

Alternating Current Electrolysis. Part V. Formation of Chlorate and Hypochlorite During A.C. Electrolysis of Hot Sodium Chloride Solutions

K. M. JOSHI, *J. Indian Chem. Soc.*, 1956, 33, Sep., 653-656

The electrolysis of saturated solutions of NaCl at 70° using Pt electrodes with symmetrical alter-

nating current was carried out under various conditions of frequency, current density and pH, using $K_2Cr_2O_7$ as depolariser. An explanation of the observed phenomena based on the recombination reactions taking place at the electrodes is offered.

The Preparation of Persulphate with a Cooled Platinum Anode

Y. SHIBASAKI and T. OTAKI, *J. Electrochem. Soc. Japan*, 1956, **24**, May, 225-229 (English summary)

The electrolysis of acidic ammonium sulphate solution using a hollow cylindrical Pt anode was studied in order to find the relationship between the current efficiency of formation of persulphate, the temperature of the anode and anolyte and the anode potential. The current efficiency is shown to increase as the temperature of the anode or the anolyte decreases; the efficiency of the process can thus be maintained at a high level by water cooling the hollow Pt anode.

Hydrogen Overvoltage on Bright Iridium and Rhodium

J. P. HOARE and S. SCHULDINER, *J. Chem. Physics*, 1956, **25**, Oct., 786

Hydrogen overvoltage measurements on bright Ir and Rh were carried out in highly purified 2N H_2SO_4 at 29° C with Pt/ H_2 as a reference electrode. The curves of overvoltage against log apparent current density are about the same for both Ir and Rh and both would be acceptable as hydrogen electrodes.

ELECTRODEPOSITION

Electrochemical Research on Ruthenium by Radioactive Tracer Methods. II Cathodic Deposition: Applications

M. HAÏSSINSKY and M. A. EL GUEBELY, *J. Chim. Phys.*, 1956, **53**, Sept., 744-752

The influence of prepolarisation of the cathode and of temperature on the cathodic deposition of radio-Ru in H_2SO_4 solution on electrodes of Au, Pt, platinised Pt, and Pb is studied. Graphs showing the effect of temperature on the percentage deposition of Ru are given, and it is shown that the pretreatment of the electrode also has a profound effect. For deposition on Pt or Au the temperature and voltage for an efficient and adherent Ru deposit are very critical, high temperatures being required, but Ru is deposited spontaneously on Pb at room temperature probably because of the anionic complexes formed by Ru in solution. Some possible applications of these deposits are given.

An Iridium Plating Solution

P. J. OVENDEN, *Nature*, 1957, **179**, Jan. 5, 39

A short note on an Ir plating bath which gives a dark grey coherent deposit of Ir satisfactory for electrochemical work. The deposition is carried out at room temperature and a current density of 20 ma/cm².

LABORATORY APPARATUS AND TECHNIQUE

A Method for the Continuous Measurement of the High Temperature Heat Content of Glasses and of Fused Salts

M. TASHIRO, *Glass Ind.*, 1956, **37**, Oct., 549-552

Describes the adaptation of a calorimeter developed by Oelsen for metallurgical use to the continuous measurement of the high temperature heat content of glasses and fused salts. A specially designed sample holder to ensure uniform heat distribution in the molten glass is constructed. This consists of a Pt crucible fitted with a thermocouple well with eight radial fins, also of Pt, into which is inserted a Pt:Pt-Rh thermocouple. Experiments were carried out on B_2O_3 , $Na_2O.2SiO_2$, and $K_2O.2SiO_2$ glasses and on the salts NaCl, $NaNO_3$ and KNO_3 in the temperature range 25-1000°C, and results were obtained which agreed well with previously published data. This apparatus permits a heat content-temperature curve for a sample to be obtained in about an hour.

Wetting Properties and Mechanical Strength in Glass-Metal Joints

W. WEISS, *Glastechn. Ber.*, 1956, **29**, (10), 386-392

The wettability of the metals Pt, Mo and W by glasses with systematically varying compositions in oxidising and reducing atmospheres at 1300°C has been studied. Wettability and surface tension of the glass are not related, but the boundary surface forces between the glass and the metal are responsible for the wetting properties. The same forces determine the adhesion at a glass-Pt joint at room temperatures. In an oxidising atmosphere the adhesion of the Pt to glass increases with wettability and increasing surface tension of the glass.

The Hot-Wire Anemometer in Supersonic Flow

ANON., *Instrument Practice*, 1956, **10**, Dec., III3-III4

Describes work done for the National Bureau of Standards on the adaptation of the hot-wire anemometer to the measurement of turbulent flow in the transonic and supersonic range. The wires used had to be as fine as possible because of the very high frequencies (about 10^5 cycles/sec.) involved, so wires of Pt, W and Pt-Rh were made with diameters as small as 5×10^{-6} in. Tests indicate that this instrument would give satisfactory results in this range.

Analytical Applications of a Differential Thermal Analysis Apparatus

P. D. GARN and S. J. FLASCHEN, *Analyt. Chem.*, 1957, **29**, Feb., 271-275

An apparatus for differential thermal analysis is described in which an attempt has been made to

combine as many advantages as possible of previous systems. The high temperature furnace incorporates a Pt heating element wound on alumina, a Pt:Pt-10% Rh control thermocouple and a differential thermocouple of Pt-10% Rh with a joining wire of Pt or a Pd-Au alloy, and is designed to raise the temperature to 1500°C at a known constant rate.

Hot Wire Liquid Level Indicator

A. MAIMONI, *Rev. Sci. Instruments*, 1956, **27**, Dec., 1024-1027

The theory of liquid level determination by measurement of the resistance of a heated wire is developed and applied to the design of a liquid-nitrogen level indicator. The sensing element was a Pt ribbon and the instrument had a power dissipation of 3.4 mw/in. of length and a deviation from linearity in the calibration of <0.1 in.

CATALYSIS

An Unexpected Catalytic Dehydrogenation

R. L. MOSS and C. KEMBALL, *Nature*, 1956, **178**, Nov. 10, 1069

In investigations on the decomposition of cyclohexylamine in the presence of H₂ over evaporated Pt films at 134°C the initial reaction product was not cyclohexane, as was expected, but benzene, due to the selective action of the catalyst. Cyclohexane was eventually formed by catalytic hydrogenation of the benzene, but not until all the amine, which apparently acts as an inhibitor, had been used up.

Amino-Sugar Syntheses II-IV

R. KUHN and W. KIRSCHENLOHR, *Ann. Chem.*, 1956, **600**, (2), 115-143

Amino-Sugar Synthesis VI

R. KUHN and H. J. HAAS, *ibid.*, 148-155

The use of PdO/BaSO₄ as a catalyst in the hydrogenation and semi-hydrogenation of the amino-sugar precursors is described.

Palladium Catalysts VIII—Catalysts Prepared in the Presence of Various Organic Anions

W. D. CASH, F. T. SEMENTIUK and W. H. HARTUNG, *J. Org. Chem.*, 1956, **21**, Sep., 999-1002

Palladised charcoal catalysts were prepared by reducing ionic Pd in buffer solutions of acetic, mandelic, succinic, lactic and tartaric acids with their sodium salts, and also in the absence of any organic acid, to study the effect these methods of preparation had on their activity. The catalysts were studied in the hydrogenation of six organic compounds; in the cases of nitrobenzene, quinone and propiophenone significant differences were found in the activities of the catalysts, different ones being the most active in each case, but in the reduction of benzaldehyde, benzyl alcohol and piperonal oxime the activities of all

the catalysts were about the same. The variations in activity were thought to be related to differences in the final crystalline form of the adsorbed Pd due to interaction with the organic anions.

The Controlled Semi-Hydrogenation of Tert-Ethynyl Carbinols and Their Acetate Esters

G. F. HENNON, W. A. SCHROEDER, R. P. LU and W. B. SCANLON, *J. Org. Chem.*, 1956, **21**, Oct., 1142-1144

Describes the preparation of dialkylvinylcarbinols and their esters by the semi-hydrogenation of the corresponding ethynyl compounds using 5% Pd-BaCO₃ catalyst preferably in petroleum ether solution, with an initial hydrogen pressure of about 50 p.s.i.g.; the control of temperature in the range 20-40° is very critical and is best achieved by adjustment of the amount of catalyst used.

Refinery Integrates Three Hydrofiners

A. BRANDON and L. W. ZAHNSTEGER, *Petroleum Refiner*, 1956, **35**, Oct., 166-168

At Esso's Baltimore refinery it has been found economical to integrate three hydrofiners, one of which pretreats charge for a powerformer by removing sulphur which would poison the sensitive Pt catalyst. Powerformer charge is heavy virgin naphtha and this is vaporised and passed in series through three reactors containing beds of Pt catalyst pills. Its octane number is increased from 50 to 85-92.

What Happens in a Cat Reformer?

G. F. EISELE and R. SMITH, *Petroleum Eng.*, 1956, **28**, Oct., C-37

A summary is given of the first nineteen months' operation in the first commercial unit using a Sinclair-Baker catalyst, which is a moderate Pt content regenerative catalyst of high life expectancy.

Treating Obnoxious Gaseous Effluents with the Oxycat

ANON. *Wire Industry*, 1956, **23**, Nov., 1004

Describes the use of the Oxycat unit, which contains a film of catalytic alumina and platinum alloy, in the oxidation of industrial effluents of all kinds, rendering them harmless; the hot clean oxidised gases and air can be recycled for heating purposes.

Catalytic Hydrogenation of Acetone on Evaporated Metallic Films

C. T. H. STODDART and C. KEMBALL, *J. Colloid Sci.*, 1956, **11**, (4/5), 532-542

The catalytic reaction between acetone vapour and hydrogen on evaporated metallic catalysts of Pt, Ni, W, Fe, Pd and Au was investigated. The main reaction observed was the formation of isopropanol, but on Pt some propane was formed

simultaneously. The order of activity for the metals was the same as that for the hydrogenation of ethylene with the exception of Pd.

The Catalytic Fission of the Carbon-Nitrogen Bond. I. The Reactions of Methylamine and Hydrogen on Evaporated Metal Films

C. KEMBALL and R. L. MOSS, *Proc. Roy. Soc.*, 1956, **A238**, Dec. 4, 107-116

A study of the catalytic fission of the C-N bond is begun by following the reactions of methylamine in the presence of hydrogen on evaporated metallic films of Pd, Pt, Ni, Fe and W. The expected products, methane and ammonia, were formed with higher amines and some loss of carbon to the catalyst. The effects of temperature and methylamine pressure on the reaction rate were determined, a reaction mechanism was postulated, and activation energies derived.

On the Evaporation of Platinum in the Course of the Combustion of Methane

P. BUSSIERE, B. DOMANSKI, C. EYRAUD and M. PRETTRE, *Compt. rend.*, 1956, **243**, (23), 1870-1872 (see *Platinum Metals Rev.*, 1957, **1**, (1), 30)

A study of the mechanism of CH₄ combustion over Pt was continued by investigating the possibility of the reaction taking place in a homogeneous phase by evaporation of the catalyst. Using active ¹⁹⁷Pt obtained by irradiation it was shown that at the reaction temperature, 1250°C, the evaporation of the Pt was considerably greater when the combustible gas CH₄ was present.

Microstructure of Platinum Ribbon Subjected to Catalytic Activation. Combustion of an Air-Methane Mixture

C. EYRAUD, B. DOMANSKI and C. BERGER, *Bull. Soc. Chim. France*, 1956, (11/12), 1765-1767

Micrographic examination of Pt heated to high temperatures in an air-methane mixture shows that crystal size and catalytic activity are not related, but that there seems to be some connection between surface roughness and activity, particularly when the Pt has been treated at a high temperature.

Characteristics and Catalytic Effect of Solids

H. NOLLER, *Angew. Chem.*, 1956, **68**, (24), 761-776

This article consists mainly of a summary of the subjects discussed at the 55th Congress of the German Bunsengesellschaft at Freiburg and is a survey of the present state of research in the field of heterogeneous catalysis. Pd and Pt are among the examples given in the article which includes sections on the mechanism of diffusion and adsorption, the electronic characteristics of catalytic metals and the theory of active centres.

Cosden's New Rexformer

ANON., *Petroleum Processing*, 1956, **11**, Nov., 79-81

The first commercial Rexforming unit to be built is now operating at Cosden Petroleum Cor-

poration's Texas refinery. The Rexforming process combines catalytic reforming over a fixed-bed Pt catalyst with a solvent extraction unit employing aqueous glycol; the main advantage is that less severe reforming conditions are required since unreacted paraffins pass through the glycol column and can be recycled. A flow-diagram for the Rexformer and details of its method of operation are given.

Study of the Platinum Catalysed Autoxidation of Ethanol using ¹⁸O

M. ROTTENBURG and P. BAERTSCHI, *Helv. Chim. Acta*, 1956, **39**, (7), 1973-1975

The autoxidation of ethanol in water catalysed by 10% Pt/C was studied using ¹⁸O as a tracer. The results are discussed in terms of two possible alternative mechanisms.

Paraffin Sorption on Clean Metals. Part I The Behaviour of Different Metals towards CH₄ and C₂H₆

B. M. W. TRAPNELL, *Trans. Faraday Soc.*, 1956, **52**, Dec., 1618-1622

The amounts of CH₄ and C₂H₆ sorbed by vacuum evaporated films of W, Mo, Ta, Cr, Rh, Pd and Ti between -78 and 70°C were investigated, and it was found that even at 70°C neither gas covers the metal surface completely. The behaviour of the adsorbed layers on Pd and Rh is discussed in some detail, and a connection is found between the catalytic activity in deuterium exchange reactions and the sorption velocity.

Selective Analytical Hydrogenation of Olefinic Distillates

H. I. WATERMAN, A. B. R. WEBER and C. ZWEEKHORST, *J. Inst. Petroleum*, 1956, **42**, Dec., 349-354

Selective hydrogenation is often necessary in the preparation of reformed or cracked petroleum fractions for analysis, since the modern analytical processes require olefin-free samples. The following catalysts were therefore tested for selectivity in the hydrogenation of a petroleum fraction boiling between 200 and 260°: Ni/Kieselguhr, Raney Ni, Mo/C, Pd/C, Pt/Al₂O₃, and Pt/Al₂O₃-SiO₂. The hydrogenations were mostly carried out at 10 or 100 atm. initial pressure, 1 hr. reaction time at 20-300°, and a catalyst to oil ratio of 1:4. The methods of preparing the catalysts are described, as is the method of analysis of starting materials and hydrogenated oils by the Fluorescent Indicator Adsorption method. The hydrogenation is defined as selective when the volume per cent of aromatics remains constant while the volume per cent of olefins becomes less than one unit (bromine value <1). The results are presented in tabular form and graphs show the performance of each catalyst. The Ni, Pd/C and Pt/Al₂O₃ catalysts are not selective under the conditions investigated, while the Mo/C catalyst is selective

at 300° and 100 atm., and the Pt/Al₂O₃-SiO₂ at 150° and 10 atm., the latter being preferable because of the less drastic conditions required.

CATHODIC PROTECTION

Cathodic Protection of Iron

M. J. PRYOR, *Nature*, 1956, **178**, Dec. 1, 1245-1246

The mechanisms involved in the cathodic protection of Fe by an impressed current anode of Pt are investigated. The results indicate that the present theory of cathodic protection is applicable only to a limited number of cases.

CHEMICAL TECHNOLOGY

Platinum Metals in the Chemical Industries

J. M. PIRIE, *Chem. & Process Eng.*, 1957, **38**, Jan., 11-14

A review of the large range of uses of Pt metals and alloys in the chemical industry. These include high temperature uses, for example Pt containers in the glass industry and Pt : Pt-Rh thermocouples, and catalytic uses such as Platforming, Pt-Rh catalysts for ammonia synthesis and supported Pd catalysts for hydrogenation reactions.

GLASS TECHNOLOGY

Phase Separation Induced by Platinum in Sodium Phosphate Melts

G. E. RINDONE and R. J. RYDER, *Glass Ind.*, 1957, Jan., 29-31

The introduction of 0.0005-0.006% of Pt coloured sodium phosphate melts grey, and in addition it was found that between 0.002 and 0.006% induced devitrification of the melt on cooling. Electron microscope investigations showed that the Pt nuclei caused the glass melt to separate into two liquid phases which enhanced the devitrification of the melt. This phenomenon was interpreted by the presence of two basically different structural groups in the glass melt which became unmixed in the presence of Pt. Further experiments indicate that this is due to the adsorption on the Pt particles of a phase richer in P₂O₅ than the rest of the melt.

ELECTRICAL ENGINEERING

Design Features of Bell System Wire Spring Relays

H. M. KNAPP, *Communication & Electronics (A.I.E.E. Trans.)*, 1956, Sep., 482-486

Describes the special features in the design of the Bell Telephone System wire spring relays which contribute to automatic control in the important operating characteristics relating directly to spring forces and armature travel. The position of the stationary contacts, composed of Pd coated Ni contact tape, is one of the dimensions controlling the contact closure point and contact interval both

of which help to define the amount of armature travel.

Manufacturing Wire Spring Relays for Switching Systems

J. W. RICE, *Communication and Electronics (A.I.E.E. Trans.)*, 1956, Nov., 513-518

Describes the machines and techniques used by the Western Electric Co. in the mass production of the Bell Telephone System's new wire spring relay to the required close tolerances. The twin-wire bimetallic Pd-Au contacts are contact-welded to the tip of each wire, while the contacts on the single wire blocks, which consist of cupro-nickel with a layer of Pd on one or both sides, are percussion welded to the tips of the wires in the required combinations.

Miniature Slip Rings

ANON., *Elect. Manufacturer*, 1957, **1**, Jan., 8-9

Describes Kelvin Hughes's improved method of manufacturing miniature slip ring assemblies. The rings are machined from Cu-Pd alloy and assembled into a mould where they are gripped into position by the injection of polystyrene, which also serves as an insulating base. These assemblies are suitable for use between -40 and 85°C and are corrosion resistant.

Material Transfer in Electrical Make and Break Contacts

A. KEIL and W. MERL, *Z. Metallkunde*, 1957, **48**, Jan., 16-24

Three different mechanisms of material transfer at contacts in a DC circuit are described. They are bridge-transfer, short arc-transfer and arc-transfer. Some examples of arc-transfer at W contacts and some Ag alloy contacts are given. Short arc-transfer is influenced by the thermal conductivity of the contact material, so that the transferred quantity is lower for an ordered Pd-40% Cu alloy and for a Au-3% Co alloy when Co is precipitated from solid solution by thermal treatment. The material transferred between Au-Co contacts and condensed by short arc-transfer on the cathode consists mainly of solid solution and hardening effects may be observed. Material condensed by arc-transfer on the anodes contains oxide and therefore does not harden.

TEMPERATURE MEASUREMENT

The Freezing Points of High Purity Metals as Precision Temperature Standards.

1. Precision Measurements with Standard Resistance Thermometers

E. H. McLAREN, *Canad. J. Physics*, 1957, **35**, Jan., 78-90

The techniques and difficulties encountered in precision measurements with Pt resistance

thermometers are discussed. Errors may arise in the resistance bridge, in the Pt wire of the thermometer and in the water triple point cells. The relative drift of resistance coils in Mueller resistance bridges is <1 ppm/year. The intrinsic resistance of a Pt thermometer is comparatively unstable since the wires are annealed,

and cold work and heat treatment affect their temperature coefficient. The errors arising from the cells were determined by measurements on reproducibility and long-term stability of cell temperatures. The limiting uncertainties due to variations in these three factors are each of the order of 10⁻⁴°C.

NEW PATENTS

Reactivating Spent Catalyst

ESSO RESEARCH & ENGINEERING CO. *British Patent* 760,612

A spent supported platinum or palladium hydroforming catalyst is reactivated by contacting it at elevated temperature with fluorine, chlorine or bromine or with a first substance containing halogen which is labile and with a second substance having oxidising properties under the contacting conditions. The substances are so chosen that not more than 10 wt % of the metal and not more than 20 wt % of the support is removed from the catalyst during reactivation.

Catalytic Hydrogenation

LAPORTE CHEMICALS LTD. *British Patent* 760,737

Alkylated or arylated anthraquinones in solution are reduced by hydrogen in the presence of a palladium on silica-alumina catalyst which has been prepared by impregnating the carrier with a palladium compound, by adsorption from an aqueous solution of palladium nitrate or chloride and then treating the catalyst with an aqueous alkaline solution, followed by reduction to the metal.

Catalytic Combustion of Hydrocarbons

GOGAS GOCH & CO. *British Patent* 760,796

Apparatus for flameless combustion of propane, methane or town gas comprises a catalytic mass, e.g. platinum on asbestos fibres or silica gel, arranged in a housing on a heat storage body formed by a gas-pervious ceramic or metallic plate having a minimum width greater than its thickness and a gas distributing chamber formed between the plate and the base of the housing.

Measuring Concentration of Gases

A. LIGHT *British Patent* 761,055

The presence of oxygen or hydrogen in a gas or gaseous mixture is detected by flowing a stream of the gas over a palladium catalyst and measuring any rise in temperature of the catalyst above the temperature of the gas stream flowing towards the catalyst. The catalyst may consist of finely divided palladium supported in a plate of sintered glass forming the wall of a tube through which the gas flows, a platinum resistance element being wound on the outside of the tube.

Hydroforming Catalyst

STANDARD OIL CO. *British Patent* 761,192

A hydroforming catalyst of improved activity and in which the catalyst metal is uniformly distributed throughout the carrier is prepared by impregnating solid hydrous alumina (1-30% by weight of combined water based on dry Al₂O₃), in the presence of 0.001-0.02 mole of a water soluble inorganic aluminium salt per mole of dry Al₂O₃, with a solution of a platinum compound in quantity to add 0.01-1% of platinum, drying and calcining the mixture. The aluminium salt is preferably aluminium chloride and a solution of chloroplatinic acid is used.

Production of Fully Hydrogenated Aromatic Hydrocarbons

THE COAL TAR RESEARCH ASSOCIATION *British Patent* 761,755

Polynuclear aromatic hydrocarbons and/or partially hydrogenated polynuclear aromatic hydrocarbons are passed entirely in the vapour phase at 20-100 atmospheres partial hydrogen pressure at 200-500°C over a Group VIII catalyst, e.g. metallic platinum, either alone or supported on a carrier and preferably containing promoting substances such as thoria.

Joining Metal Members to Ceramic Members

STANDARD TELEPHONES & CABLES LTD. *British Patent* 762,105

A metal member is joined to a ceramic member, e.g. a ceramic support rod in electric discharge devices, by electroplating an area of the ceramic with a metal coating and then spot welding the metal member to it. For example, a ceramic rod is painted with a colloidal suspension of platinum in oil of lavender and the rod heated to 500°C to give a very thin conducting layer. Copper is then plated on to the platinum coating, and an end cap of copper-nickel alloy is spot welded in place.

Conversion of Crude Oil

UNIVERSAL OIL PRODUCTS CO. *British Patent* 761,847

A reforming catalyst composed of alumina and 0.05-1.5% of platinum and preferably containing