

ABSTRACTS

of current literature on the platinum metals and their alloys

PROPERTIES

The Adsorption of Sulfur on the Platinum (100) Surface

T. E. FISCHER and S. R. KELEMEN, *Surface Sci.*, 1977, **69**, (1), 1-22

Pt(100) surfaces of 1×1 and 5×20 structure were exposed to H_2S . Repulsive interaction appeared between S atoms, and S adsorption decreased the Pt work function by 0.7 eV at saturation coverage. The lowering of the work function and analogy with PtS_2 properties may be due to a covalent bonding of S to Pt in which every S atom is bonded to four Pt neighbours. The repulsive S atom interaction is indirect through the Pt.

The Effect of Silver Interdiffusion on the Catalytic Activity of Thin Platinum and Palladium Films in the Reduction of Ag_2S Films

T. FLEISCH and R. ABERMANN, *Thin Solid Films*, 1977, **46**, (2), 167-175

Electron microscopic studies of the effect of Ag interdiffusion on the catalytic activity of thin Pt and Pd films showed a loss of catalytic activity by the films. This deactivation was delayed considerably by preventing direct contact between the Ag_2S film and the catalyst.

Some Bulk and Thin Film Properties of $ZrPt_3$ and $HfPt_3$

L. M. PECORA and P. J. FICALORA, *J. Electron. Mater.*, 1977, **6**, (5), 531-540

Bulk and thin films of $ZrPt_3$ and $HfPt_3$ had excellent corrosion resistance to chemically corrosive environments, and excellent electrical conductivity. To evaluate both properties simultaneously a relay contact test was performed with one pole of a double pole single throw relay coated with $HfPt_3$. The uncoated pole failed under a resistive load while the coated pole was still operative. Oxidation experiments, hardness and density measurements, and structure of morphology were also examined.

Magneto-Catalytic Effects on Palladium-Nickel Layers

I. I. MAKEICHEVA, V. D. YAGODOVSKII and E. P. LUZ, *Zh. Fiz. Khim.*, 1977, **51**, (11), 2847-2849

Studies of the activation energy of NH_3 decomposition on mixed Pd-Ni magnetic layers showed changes during the catalyst transition from the ferromagnetic to the paramagnetic state. No changes were observed on non-magnetic layers. The magneto-catalytic effect was found to be due

to changes in the performance of the electrical discharge which is accompanied by changes in the mechanism of NH_3 decomposition.

Electron Transport Properties of Palladium-Ruthenium Alloys from 50 mK to 4.2 K

P. A. SCHROEDER and C. UHER, *J. Low Temp. Phys.*, 1977, **29**, (5/6), 487-498

The thermopower, resistivity, thermal conductivity and thermoelectric ratio of Pd-Ru alloys containing 0.1, 0.5, 1.0 or 5.0 at.% Ru were measured between ~ 50 mK to 4.2 K. The thermopower varied linearly with temperature, and is only a slowly varying function of concentration up to 1 at.% Ru. The thermopower of Pd-0.1 at.% Ru is 0.23 ± 0.01 $T\mu V/K$. Below ~ 0.15 K the departures from linearity may be due to magnetic impurities. In the same temperature range the thermoelectric ratio departs from its expected constant value.

Corrosion Resistance of Copper, Silver, Palladium and Their Alloys in Polyphosphate-Boron Melts

V. P. KOCHERGIN, B. I. METAL'NIKOV, V. I. KISLITSIN and E. N. KALASHNIKOVA, *Zashchita Metal.*, 1977, **13**, (6), 729-731

Corrosion resistance of Pd, Ag, Cu, 30 wt.% Pd-Ag and 60 wt.% Pd-Ag alloys was studied, in various polyphosphate- B_2O_3 melts, at 850°C using X-ray diffraction measurements. Pd had a high corrosion resistance.

The Thermochemistry of Transition Metal Sulfides

S. R. SHATYNSKI, *Oxid. Met.*, 1977, **11**, (6), 307-320
The decomposition temperatures, Gibb's energies of formation and general thermochemical data are given for Pt, Pd, Rh, Ir, Ru and Os sulphides.

A Physico-Chemical Investigation of Interaction of Rhodium with Vanadium

O. V. AKSIONOVA, V. V. KUPRINA, V. B. BERNARD and R. O. SKOLOZDRA, *Vestnik Moskov. Univ., Ser. II Khim.*, 1977, **18**, (4), 429-432

Metallographic and X-ray studies of the V-Rh system showed six intermediate phases: cubic V_3Rh which is isostructural to Cr_3O , tetragonal α_3 which is the CuAu type structure, orthorhombic V_3Rh_5 , cubic VRh_3 which is the Cu_3Au type structure, and the α_1 and high temperature α_2 phases with unknown structures. The phases V_3Rh , α_1 , α_2 , α_3 and V_3Rh_5 were found to melt peritectically while the VRh_3 phase had the maximum melting point.

Electron Microscopy Studies of Metal Clusters: Ru, Os, Ru-Cu, and Os-Cu

E. B. PRESTRIDGE, G. H. VIA and J. H. SINFELT, *J. Catalysis*, 1977, **50**, (1), 115-123

Data on size and shape of Ru-Cu, Os-Cu, Ru and Os clusters dispersed on silica carriers were obtained by electron microscopy. Os and Os-Cu clusters had high dispersion with average cluster diameters of 12 and 10 Å, respectively. The average diameters of Ru and Ru-Cu clusters were three times larger, and very thin, raft-like clusters were found with diameters of 60 Å. Raft-like Ru clusters may consist of a single atomic layer, and raft-like Ru-Cu clusters appear to have a Ru atom layer covered by Cu atoms. Some clusters are three dimensional instead of raft-like.

Studies of the Effect of Thermal Treatment on Properties of an Electrodeposited Iridium Catalyst

O. G. NOVOZHILOVA, A. I. PLETYUSHKINA, V. K. PORTNOI, A. D. SEMENOVA and G. D. VOVCHEENKO, *Zh. Fiz. Khim.*, 1977, **51**, (11), 2976-2978

The effect of thermal treatment at 100-600°C in Ar, O₂ or H₂ atmospheres on the properties of an electrodeposited Ir catalyst was studied during the reduction of malate and nitromethane. The results showed changes in dispersion, surface morphology, adsorption ability and catalytic properties, depending on conditions.

CHEMICAL COMPOUNDS

Solvolytic of *cis*-[Pt(NH₃)₂Cl₂] in Dimethyl Sulphoxide and Reactions of Glycine with [PtCl₃(Me₂SO)]⁻ as Probed by ¹⁹⁵Pt Nuclear Magnetic Resonance Shifts and ¹⁹⁵Pt-¹⁵N Coupling Constants

S. J. S. KERRISON and P. J. SADLER, *J. Chem. Soc., Chem. Commun.*, 1977, (23), 861-864

The formation of six products from the solvolysis of *cis*-[Pt(NH₃)₂Cl₂] in Me₂SO was monitored by ¹⁹⁵Pt NMR shifts and ¹⁹⁵Pt-¹⁵N coupling constants. The products included mono- and tri-amine species. The same method can identify the more thermodynamically stable isomer of [Pt(glycinate)(Me₂SO)Cl].

The Photochemical Behaviour of {PtCl₂(olefin)(amine)} Complexes, Effect of the Type of Olefin and the Configuration of the Complex

P. COURTOT, R. RUMIN and A. PERON, *J. Organometal. Chem.*, 1978, **144**, (3), 357-369

Irradiation of {PtCl₂(olefin)(amine)} disposes of the olefinic ligand and forms a dimeric compound {PtCl₂(amine)}₂ with a *trans* configuration. The same effect is seen with a *cis* or *trans* starting compound and different irradiation wavelengths. The primary photochemical reaction arises via a (d → π* C₂H₄) charge transfer excited state.

Palladium-Chloride-π-Allyl Complexes from Calciferol and Related Compounds

D. H. R. BARTON and H. PATIN, *J. Chem. Soc., Chem. Commun.*, 1977, (22), 799-800

π-allyl complexes of Pd were prepared from calciferol, ergosterol, 3-epi-ergosterol and 7-dehydrocholesterol. These complexes are useful because of their reactivity with nucleophiles and their oxidisability to allylic alcohols. π-allyls may modify biologically active vitamin D analogues. Cholesterol, when palladated, gave no reaction.

Rhodium Atom Chemistry. 2. Interaction of Small, Well-Defined Rhodium Clusters with Dioxygen. Rh₂(O₂)_n and Rh₃(O₂)_m, Localised Bonding Models for Dioxygen Chemisorption on Rhodium Metal

A. J. L. HANLAN and G. A. OZIN, *Inorg. Chem.*, 1977, **16**, (11), 2857-2863

The interaction of small, well-defined Rh clusters (n = 2 or 3) with dimolecular oxygen was investigated. Some binuclear dioxygen complexes of the type Rh₂(O₂)_n (where n = 1, 2, 3 or 4) and trinuclear Rh₃(O₂)_m (where m is 2 or 6) have been identified. The cluster complexes are discussed in terms of their relevance to heterogeneous oxidation catalyses involving olefins.

Synthesis and X-Ray Crystal Structure of Hexakis(trimethylphosphine)-tris-μ-methylene-diruthenium(III)

R. A. ANDERSEN, R. A. JONES, G. WILKINSON, M. B. HURSTHOUSE and K. M. ABDUL MAKIK, *J. Chem. Soc., Chem. Commun.*, 1977, (23), 865-866

The reaction between the dinuclear Ru₂(O₂CMe)₄Cl and MgMe₂ in the presence of PMe₃ produces complex Ru₂(CH₂)₃(PMe₃)₆ with a low yield. Higher yields are produced if the trimeric μ₃-oxo-centred acetate [Ru₃O(O₂CMe)₆(H₂O)₃].(O₂CMe) is used. The structure was determined by X-ray crystallography and contains three methylene bridges.

Photoinduced Redox Reactions of Hydrophobic Ruthenium(II) Complexes

P. J. DELAIVE, J. T. LEE, H. W. SPRINTSCHNIK, H. ABRUÑA, T. J. MEYER and D. G. WHITTEN, *J. Am. Chem. Soc.*, 1977, **99**, (21), 7094-7097

Water-insoluble complexes, with a polar, charged Ru(bipy)²⁺ core were synthesised. These complexes have intense absorption and luminescence in the visible region in acetonitrile solution. The luminescence can be quenched by electron donors and acceptors in acetonitrile solution. The net reaction involves using visible light for the storage of energy. The Ru(II)⁺¹ species, stable under photolysis conditions, is highly reactive with several reagents including oxygen and water. A practical prolonged energy storage system will need an efficient secondary electron acceptor to regenerate the photoactive Ru(II)²⁺ complex.

Origin of Photocarriers in Ru(2,2'-bipyridine)₃Cl₂·6H₂O Single Crystals

G. GIRO and P. DI MARCO, *Phys. Status Solidi A*, 1977, **42**, (2), K179-K182

Photoconductivity measurements on Ru(2,2'-bipyridine)₃Cl₂·6H₂O single crystals and absorption and emission spectra were studied. It was found that the relationship between photocurrent, i , and light intensity is $i \sim I^n$ where $0.5 < n < 0.75$; and the photocurrent peaks occur at wavelengths where the absorption coefficient is between 1 and 1000/cm.

ELECTROCHEMISTRY

Electroreduction of Acetone on Platinum in Sulfuric Acid Solution and Catalytic Action of Platinum and Mercury Electrodes

H. KITA, K. SAITO and A. KATAYAMA, *J. Res. Inst. Catalysis, Hokkaido Univ.*, 1977, **25**, (2), 45-62

Electroreduction of acetone was carried out on smooth and platinised Pt electrodes in H₂SO₄. The results were compared with those obtained on the electroreductions of C₂H₄ on Pt, and of C₂H₄ and acetone on Hg. Acetone reduces on a Pt electrode at a slower rate than C₂H₄. It is concluded that H atoms and acetone adsorb on different facets and that the combination of the adsorbed H and acetone at the boundary between the two facets is rate controlling. The limiting current is due to the surface diffusion of the adsorbed acetone to the boundary.

Mass Transport Processes at Porous Electrocatalysts in the Electrogenative Reactor

G. P. SAKELLAROPOULOS and S. H. LANGER, *J. Electrochem. Soc.*, 1977, **124**, (10), 1548-1556

Mass transport limitations were investigated in the electrolyte gas phase and in the pores of Pt and Pd black porous electro-catalysts. In a matrix supported electrolyte hydrogen ion diffusion was 3-5 times slower than in a free electrolyte. Limiting currents were identical for both catalysts, and were concentration dependent. No ionic pore diffusion limitations were observed.

Mechanism of the Chlorine Evolution on a Ruthenium Oxide/Titanium Oxide Electrode and on a Ruthenium Electrode

L. J. J. JANSSEN, L. M. C. STARMANS, J. G. VISSER and E. BARENDRECHT, *Electrochim. Acta*, 1977, **22**, (10), 1093-1100

The mechanism of the Cl evolution was studied on Ti electrodes coated with a layer of RuO₂ and TiO₂ and on a Ru electrode in acidic chloride solution. Potentiodynamic current density-potential curves were recorded as a function of the time of anodic pre-polarisation, composition of the solution and temperature. The transfer coefficient was 0.5 for the Cl evolution at an "ideal" RuO₂/TiO₂, and at a Ru, electrode.

ELECTRODEPOSITION AND SURFACE COATINGS

Investigation of Electrolytic Deposition of Palladium

H. D. HEDRICH, and C. J. RAUB, *Metalloberfläche*, 1977, **31**, (11), 512-520

Electrolytic deposition of Pd was studied in acidic PdCl₂, ammoniacal Pd(NH₃)₄²⁺ and Pd(NH₃)₂(NO₂)₂ electrolytes. In acidic PdCl₂ Pd deposition occurred with high current gain at the cathode while in ammoniacal baths the Pd was bound in a strong complex, so no charge exchange occurred. Hydrogen was evolved and heterogeneous β- and α-Pd-H alloys resulted. Pd(NH₃)₂(NO₂)₂ produced a smooth, shiny precipitation with a current gain of 60-70%; the Pd layers had similar properties to those produced in Pd(NH₃)₄²⁺.

HETEROGENEOUS CATALYSIS

The Interaction of CO with a Pt/Al₂O₃ Catalyst

B. BOZKURT and H.-G. LINTZ, *Ber. Bunsenges. Phys. Chem.*, 1977, **81**, (11), 1161-1163

Volumetric studies of the adsorption of CO on 0.7 wt.% Pt/γ-Al₂O₃ having a specific surface area of 250 m²/g were carried out under pressures up to 0.6 bars at 40, 80 and 120°C. The chemisorbed quantity of CO was independent of temperature, corresponding to a specific surface area of the active component of the order of 0.35 m²/g catalyst.

Behavior of Platinum Crystallites on Carbon Substrates

Y. F. CHU and E. RUCKENSTEIN, *Surface Sci.*, 1977, **67**, (2), 517-540

A C film model catalyst, on which metal crystallites were deposited, was used to examine the sintering of Pt crystallites at various temperatures and times. Pt crystallites as large as 20 nm migrated upon the substrate surface and sintered to form large crystallites. The chemical atmosphere, especially O₂ or water vapour, affected the migration and Pt crystallites reacted with O₂ or water vapour at 500°C to form Pt oxide.

Reduction of Some Oxy-Compounds on Platinum Catalysts in Buffer Solutions

D. V. SOKOL'SKII and A. UALIKHANOVA, *Zh. Priklad. Khim.*, 1977, **50**, (10), 2235-2238

Hydrogenation of acetone and aldehyde was carried out over Pt-black and 5% Pt/BaSO₄ catalysts in aqueous buffer and ethanol solutions of pH=2.2-13.5 at 30°C and 20 atm. The results showed various relationships between reaction rate and pH value linking their various adsorption abilities and keto-enol tautomerism.

Process for the Preparation of Platinum Catalysts Modified by Adsorbed Metals

S. SZABÓ, F. NAGY and D. MÓGER, *Acta Chim. Acad. Sci. Hung.*, 1977, **93**, (1), 33-42

A method for the preparation of Pt catalysts modified by adsorbed metals has been developed. Pt catalysts covered by Cu, prepared by this method showed no changes in the properties through O₂ adsorption or heat treatment up to 100°C. Studies on a Pt catalyst covered with Au showed that the original properties are retained up to 350°C.

Catalytic Dehydrogenation of Propane to Propene over Platinum and Platinum-Gold Alloys

P. BILOEN, F. M. DAUTZENBERG and W. M. H. SACHTLER, *J. Catalysis*, 1977, **50**, (1), 77-86

The rates of dehydrogenation of propane to propene over Pt and dilute Pt-Au alloys with 0.5-14.0 at. % Pt were studied. The rate per unit surface area varies linearly with Pt concentration; thus, only one Pt atom is involved in the rate determining step. Dehydrogenation may occur by dissociative chemisorption of propane on a single Pt atom to which two adsorption sites are associated. The conversion of the propyl radical into π -bonded propene via β -hydrogen elimination is rate determining.

Effects of Hydrocarbons, Carbon Monoxide and Oxygen on Sulfuric Acid Emission from an Automotive Catalyst

M. MIKKOR, R. H. HAMMERLE and T. J. TRUEX, *Ind. Engng. Chem., Prod. Res. Dev.*, 1977, **16**, (3), 217-222

Data from a flow reactor study of SO₂ oxidation over a 0.2% Pt-0.1% Pd monolithic catalyst are presented. The SO₂ oxidation is kinetically limited below ~475°C and approaches thermodynamic equilibrium at higher temperatures. Catalyst ageing results in significant reductions in SO₂ oxidation activity while still maintaining moderate to high CO and propylene oxidation activities.

Dual-State Behavior of Palladium/Alumina Catalysts in 4-Vinylcyclohexene-1 Oxidative Dehydrogenation

A. CASTELLAN and G. R. TAUSZIK, *J. Catalysis*, 1977, **50**, (1), 172-175

The effects of differently prepared Pd/Al₂O₃ catalysts during oxidative dehydrogenation of 4-vinylcyclohexene-1 (VCE) were studied. With O₂, VCE and N₂ the catalysts had the same activity and gave styrene and ethylbenzene. Catalysts reduced at room temperature with an alkaline hydrazine solution and those calcined at high temperatures had a higher styrene selectivity than catalysts reduced with H₂.

Bright Field and Hollow Cone Dark Field Electron Microscopy of Palladium Catalysts

L. A. FREEMAN, A. HOWIE and M. M. J. TREACY, *J. Microscopy*, 1977, **111**, (2), 165-178

Hollow cone dark field imaging was investigated as a technique for studying Pd catalyst particles on γ -Al₂O₃ and 70% of the particles appear in either the 111 or 200 Bragg reflections. More particles can be visible in bright field because of other Bragg reflections, as well as absorption effects. The hollow cone dark field results for Pd particle size distributions agreed with those for the bright field method. In determining the shape of small catalyst particles the two methods were similar but the dark field method gave better structural details.

Hydrogenation of Heptene-1 and Heptyne-1 on Pd/BaSO₄

D. V. SOKOL'SKII, V. A. SHOSHENKOVA and N. P. TRUKHACHEVA, *Dokl. Akad. Nauk S.S.S.R.*, 1977, **237**, (6), 1380-1383

Studies of the hydrogenation of heptene-1 and heptyne-1 were carried out over 5% Pd/BaSO₄ at 30°C in a media containing CdSO₄ in the atomic ratio of Cd:Pd=0.3-8.0. The results showed that the reduction of PdO/BaSO₄ by H₂ in the presence of CdSO₄ at a concentration ratio of Pd:Cd=1:1 resulted in a two-fold increase of the surface area of the catalyst. At the same time the activity of the catalyst decreased six-fold.

Vapour Phase Oxidation of Ethylene over Supported Palladium Sulfate Catalysts

K. HWAI-DER LIU, K. FUJIMOTO and T. KUNUGI, *Ind. Engng. Chem., Prod. Res. Dev.*, 1977, **16**, (3), 223-227

Studies of the vapour oxidation of C₂H₄ to acetaldehyde over supported PdSO₄ catalysts at 95-155°C showed that the initial activity of PdSO₄/active charcoal catalysts was high but decreased as the reaction proceeded. The inactivated catalyst was restored by treatment with concentrated HNO₃. The presence of free H₂SO₄ up to 10 wt.% increased the catalytic activity of the catalyst. PdSO₄ supported on silica gel showed catalytic activity when treated with HNO₃.

On the Active Forms of Palladium in Palladium-Zeolite Catalysts of Ethylene Oligomerisation

A. L. LAPIDUS, V. V. MAL'TSEV, E. S. SHPIRO, G. V. ANTOSHIN, V. I. GARANIN and KH. M. MINACHEV, *Izv. Akad. Nauk S.S.S.R., Ser. Khim.*, 1977, (11), 2454-2459

X-ray, photoelectron and spectroscopic studies of the catalytic activity of 3% Pd/o.75 CaNaY(SiO₂/Al₂O₃=4.4) zeolite catalysts preliminary treated in Ar or H₂ at 380 and 450°C, and in air at 20°C were carried out during C₂H₄ oligomerisation.

The results showed that only catalysts containing Pd in the cation form $[\text{Pd}(\text{NH}_3)_4]^{2+}$ were catalytically active. No activity was observed on the catalysts containing metallic Pd.

Investigation of Palladium Catalysts on a Carbon Carrier. II. Influence of Preparation Method of the Catalyst on Its Activity in Benzene Hydrogenation Reaction

J. SIEDLEWSKI and W. SMIGIEL, *Chem. Stosowana*, 1977, **21**, (3/4), 509-522

The influence of Pd deposition and pre-modification of active C surfaces on the activity of Pd/C catalysts was studied during the hydrogenation of benzene. The increase of HNO_3 concentration used for the carrier modification leads to an increase in a number of surface functional groups capable of cation-exchange. High catalytic activity was observed in catalysts prepared by Pd deposition on the surface of unmodified C containing a large concentration of functional groups.

Petroleum Distillates Hydrogenation on a Palladium-Rhenium Catalyst

G. V. SABIROVA, A. D. MARTYNUK, A. I. VALEEVA, A. S. ZHURBA, KH. M. MINACHEV, M. A. RYASHENTSEVA, N. I. VYKHRESTYUK and G. I. DERKACH, *Neftekhimiya*, 1977, **17**, (5), 678-681

Studies of the de-aromatisation of petroleum distillates containing 0.015-0.1% S were carried out during their hydrogenation over Pd-Re catalysts supported on aluminosilicates. A high conversion rate of aromatic hydrocarbons was observed at 275-300°C and 30-50 atm. The conversion rates of aromatic hydrocarbons decrease with increasing process temperatures to 375°C, followed by an increase in paraffinic hydrocarbon yields.

Liquid-Phase Catalytic Hydrogenation of Nitromethane on Rhodium and Rhodium-Osmium Alloys

A. A. SUTYAGINA, N. P. MATVEIKO and G. D. VOVCHEENKO, *Zh. Fiz. Khim.*, 1977, **51**, (12), 3117-3120

Studies of the catalytic activity of electrodeposited Rh-Os alloys were carried out during hydrogenation of nitromethane in excess H_2 in 0.1 N solutions of HCl and H_2SO_4 . The most active catalysts were Os-rich alloys containing 73-95 wt.% Os.

Pulse-Technique Analysis of the Kinetics of the Fischer-Tropsch Reaction

F. M. DAUTZENBERG, J. N. HELLE, R. A. VAN SANTEN and H. VERBEEK, *J. Catalysis*, 1977, **50**, (1), 8-14

In the Fischer-Tropsch synthesis of paraffins using two differently prepared $\text{Ru}/\gamma\text{-Al}_2\text{O}_3$ catalysts, under transient operating conditions, the paraffin chains grow at a rate of about one CH_2 group per minute. The low over-all catalytic activity may be due to the low intrinsic activity

of the exposed Ru atoms and not to a low number of active surface atoms. This method can be used to determine intrinsic catalyst characteristics.

HOMOGENEOUS CATALYSIS

$\text{RhCl}(\text{PPh}_3)_3$ -Catalysed Coupling of Diorganomercurials

K. TAKAGI, N. HAYAMA, T. OKAMOTO, Y. SAKARIBARA and S. OKA, *Bull. Chem. Soc. Japan*, 1977, **50**, (10), 2741-2743

A $\text{RhCl}(\text{PPh}_3)_3$ complex has been shown to be an effective catalyst for the reaction of various diorganomercurials to give coupling products such as conjugated diyne, biaryl and alkane in good yields and under mild conditions. A probable mechanism including the oxidation addition of organomercurials to a Rh complex was presented.

Hydrocarbons Hydrogenation Catalysed with Rhodium Complexes

I. RAITSA, A. BOROVSKY and A. MAZHETS, *Neftekhimiya*, 1977, **17**, (5), 672-677

Studies of the catalytic activity of $\text{RhCl}(\text{PPh}_3)_3$ and Rh amino acid complex catalysts were carried out during hydrogenation of hydrocarbons and/or aromatic N-containing compounds, respectively. The most active catalysts for the hydrogenation of olefinic hydrocarbons were Rh complexes containing anthranilic acids. Reaction rates of hydrogenation of olefinic hydrocarbons depend on their molecular weight; which decreases with an increase in their molecular weight.

The Catalytic Activity of Iridium Complexes during Homogeneous Hydrogenation of Unsaturated Substrates as a Function of the Type of Complex and Substrate

W. STROHMEIER, H. STEIGERWALD and M. LUKÁCS, *J. Organometal. Chem.*, 1978, **144**, (1), 135-145

The catalytic activity of Ir complexes $\text{IrClCO}[\text{P}(\text{C}_6\text{H}_{11})_3]_2$, $\text{IrCl}(\text{PPh}_3)_3$, $\text{IrHCO}[\text{PPh}_3]_3$ and $\text{IrH}_3[\text{PPh}_3]_3$ in the homogeneous hydrogenation of unsaturated substrates was investigated at 95-150°C and 10-15 bars pressure without solvent. Optimal catalyst activity for hydrogenation of C=C bonds depends on catalyst and substrate. The C=O bond is only moderately hydrogenated by $\text{IrH}_3[\text{PPh}_3]_3$.

Oxidation of Unsaturated Fatty Acids with Ruthenium and Osmium Tetroxide

T. A. FOGLIA, P. A. BARR, A. J. MALLOY and M. J. COSTANZO, *J. Am. Oil Chem. Soc.*, 1977, **54**, (11), 870A-872A

Ru and Os tetroxides were used with excess oxidant sodium hypochlorite to catalyse the alkali metal salts of oleic and undecylenic acid. Ru tetroxide cleaves the C=C bond of K oleate to give pelargonic and azelaic acids, while Na undecylenate gives sebacic acid. With Os tetroxide, hydroxylation of the double bond in K

oleate gives a 95% yield of erythro-9,10-dihydrocystearic acid, and with Na undecylenate it produces 10,11-dihydroxyundecanoic acid and sebacic acid.

ELECTRICAL AND ELECTRONIC ENGINEERING

Fritted Thick Film Conductor Adherence: Role of Firing Atmosphere

P. F. BECHER, *J. Mater. Sci.*, 1978, **13**, (2), 457-459
The adherence of a Pt-Au thick film on Al_2O_3 substrates, fired in different conditions, was determined together with the thick film substrate microstructure. The adherence is degraded by reducing firing and in Ar- H_2 , which causes very little sintering and poor metal-to-glass wetting. Firing at 850 or 950°C produced a few glass fibrils across the metal-glass interface, but none were observed after firing at 1050°C.

Effect of Tool Shape when Ultrasonic Wire Welding. Part I: Al-1% Si Wires to Pd-Ag Thick Films

C. J. DAWES, *Weld. Inst. Res. Bull.*, 1978, **19**, (1), 15-20

The effect of wedge geometry on weld reliability when ultrasonically wedge wire welding 25 μ m diameter Al-1% Si wires to Pd-Ag thick film circuits was studied. The flat wedge profile was better than the transverse groove, concave and longitudinal groove profiles. The transverse grooved wedge over deformed the wire at the welds which had low pull strengths, the concave wedge could damage the circuit films by the wedge touching the circuit track, and the longitudinal groove wedge was unsuitable because wire/groove alignment could not be achieved.

NEW PATENTS

METALS AND ALLOYS

Hydrogen-Diffusion Alloy

EUROPAISCHE ATOMGEMEINSCHAFT (EURATOM)

German Offen. 2,719,807

A membrane for separation of hydrogen from HI and I is an alloy of Pd with 5-23% Sn and/or 2-7% Si.

ELECTROCHEMISTRY

Electrochemical Cell

NATIONAL RESEARCH DEVELOPMENT CORP.

British Patent 1,496,660

Pt gauze distributors are used in an electrochemical cell in which cathode and anode are provided by a fluidised bed of C particles.

A High Voltage, High Performance Thick Film Resistor System

S. J. STEIN, C. HUANG and A. S. GELB, *Electrocomponent Sci. Technol.*, 1977, **4**, (2), 95-104

A new series of thick film resistors, based on a Ru compound semiconducting phase and dispersed in a compatible glassy matrix is described. The conducting networks present in the structure include ohmic, non-ohmic and insulating barriers. High electric fields shift the relative concentrations of these barriers by converting insulating barriers into semiconducting or conducting layers. Refiring effects, resistor geometry effects and the voltage coefficient of resistance are discussed.

TEMPERATURE MEASUREMENT

Note on the Relation between Resistance Thermometer, Thermocouple, and Radiation Temperature Scales: 630-1064°C

J. P. EVENS, *Metrologia*, 1977, **13**, (4), 171-172

Temperatures determined by radiation thermometry differ substantially from values on the International Practical Temperature Scale (I.P.T.S.) of 1968 in the range 630-1064°C. Temperatures derived from a quadratic interpolation equation for high temperature Pt resistance thermometers have similar values agreeing more with the radiation thermometry measurements than I.P.T.S. I.P.T.S. is defined in this range by a quadratic equation for a Pt-10% Rh/Pt thermocouple. These discrepancies would change if the fixed point temperature values were altered and different fixed points chosen. However, the simple quadratic interpolation equation for Pt resistance thermometers gives values close to thermodynamic values.

Oxidative Purification of Aqueous Effluents

WESTINGHOUSE ELECTRIC CORP.

British Patent 1,498,355

Waters containing small amounts of phenol are purified by electrolytic oxidation using electrodes of Pt/C or RuO_2 .

Oxygen Generation Catalyst

GENERAL ELECTRIC CO.

U.S. Patent 4,039,409

Oxygen is generated electrolytically on a catalytic anode consisting of a Pt-Ru alloy comprising reduced oxides of Pt and 5-60% Ru.

Platinum Coated Anode

G. THIELE ET AL

U.S. Patent 4,042,484

A protective cover layer for electrolytic metal anodes, for use in the production of chlorine and