

# ABSTRACTS

## of current literature on the platinum metals and their alloys

### PROPERTIES

#### A Comparison of Palladium-Silver and Palladium-Yttrium Alloys as Hydrogen Separation Membranes

D. FORT, J. P. G. FARR and I. R. HARRIS, *J. Less-common Metals*, 1975, **39**, (2), 293-308

Y-Pd alloys developed as H<sub>2</sub> diffusion membranes show significantly higher permeabilities than commercial Ag-Pd membranes and are also stronger. Oxidation of the membrane surface was also investigated.

#### The Vacancy Formation Energy in Platinum

J. S. ZETTS and J. BASS, *Phil. Mag.*, 1975, **31**, (2), 419-440

The resistivities of quenched Pt wires of diameters 16, 10 and 4 mil were measured as a function of quench temperature for a variety of quench speeds and the data were analysed in terms of the (FBL) theory of vacancy-annealing to fixed sinks during a quench. For fast quenches from below 950°C, where few if any vacancies should be lost during the quench, the data for the different wire diameters yield effective formation energies, ranging from 1.16 to 1.35 eV.

#### Reaction of Alkanes on Platinum-Tin and Platinum-Rhodium Alloy Films

Z. KARPINSKI and J. K. A. CLARKE, *J. Chem. Soc., Faraday Trans. I.*, 1975, **71**, (4), 893-902

Studies of the reactions of *n*-hexane and *n*-pentane in excess H on Sn-Pt and Rh-Pt films showed that increase of Rh content in Rh-Pt alloys caused a regular increase in hydrogenolysis selectivity. Hydrogenolysis selectivities with both hydrocarbons on Sn-Pt alloys decreased with increase of Sn content. 1,5-Cyclisation selectivity patterns are explained in terms of the change in active site (Pt) number and the possibly modified bonding capability of carbided surfaces for hydrocarbon intermediate.

#### Residual Resistivity of the Pd-Ag-H System

G. BAMBAKIDIS, R. J. SMITH and S. A. OTTERSON, *Phys. Status Solidi A, Appl. Res.*, 1974, **26**, (1), 53-60

Electrical resistivity studies of Pd<sub>1-y</sub>Ag<sub>y</sub> alloys (0 < y ≤ 0.5) with H up to H/Pd atom ratio of 0.8 at 4.2 K using the Mott two-band model showed the decrease in sp-d scattering caused by filling of the 4d band by H. The results indicate that H/Pd atom ratio is more important than H/Metal, which shows that Pd-H interaction ratio, is stronger than that between Ag and H.

#### The Temperature Programmed Desorption of Hydrogen from Platinum and Platinum-Gold Films

J. J. STEPHAN, V. PONEC and W. M. H. SACHTLER, *Surface Sci.*, 1975, **47**, (1), 403-412

Spectrometric measurements of the thermal desorption of H from Pt and Au-Pt films showed that H is more loosely bound on the alloys than on pure Pt. About 50% of the adsorbate is desorbed by pumping at 78 K from the alloys while only a very small amount is desorbed from Pt. After maximum coverage of Pt films by H adsorption three desorption peaks have been observed:  $\gamma$ (120 K),  $\beta_1$ (200 K) and  $\beta_2$ (330 K).

#### Investigation of Valence Band Structures in Cu-Pd Alloys

V. V. NEMOSHKALENKO, M. G. CHUDINOV, V. G. ALESHIN, YU. N. KUCHERENKO and L. M. SHELUDCHENKO, *Solid State Commun.*, 1975, **16**, (6), 755-757

X-ray photoelectron spectra of valence bands were obtained for Cu-Pd alloys and the density of electron states was calculated by the coherent potential method. The results show that *d*-resonance states of Pd are present in alloys with high percentage of Cu but there are no apparent *d*-resonance states of Cu in the alloys containing a high percentage of Pd.

#### Adsorption of Hydrogen by Palladium-Copper Alloys. Part 1. Experimental Measurements. Part 2. Theoretical Analysis

R. BURCH and R. G. BUSS, *J. Chem. Soc., Faraday Trans. I.*, 1975, **71**, (4), 913-921, 922-929

Electrical resistance, and pressure against composition isotherms, studies of the adsorption of H by 5, 10, 15 and 20% Cu-Pd alloys at 303-373 K showed that for each alloy, the relative resistance increased continually with H content. The solubility of H is smaller in Pd-Cu alloys than in electronically equivalent Pd-Ag alloys. The results are discussed in terms of the lattice parameters of the alloys.

#### Optical and Magneto-optical Properties of Nickel-Palladium Alloys

N. M. VOLOSHINSKAYA, I. I. SASOVSKAYA and M. M. NOSKOV, *Fiz. Metal. Metalloved.*, 1974, **38**, (6), 1134-1138

Optical constants and magneto-optical effects in 2 and 20 at.% Pd-Ni alloys at 0.42-16  $\mu$ m were measured and showed that they can be explained by an interband adsorption mechanism, rather as optical data and Hall effect data are explained.

### Auger Spectroscopy Analysis of Palladium Silicide Films

S. THOMAS and L. E. TERRY, *Appl. Phys. Lett.*, 1975, **26**, (8), 433-435

The formation of Pd<sub>2</sub>Si in Pd films sputter deposited on Si substrates and heated up to 400°C was studied spectroscopically by measuring the depth profile and Ar<sup>+</sup> ion sputtering. The depth profile showed that the silicide phase is formed at the Pd/Si surface even in the un-annealed films.

### Effect of Long-range Order and Hydrogen Content on the Low-temperature Heat Capacity of Pd<sub>3</sub>Fe

P. MERKER, G. WOLF and B. BARANOWSKI, *Phys. Status Solidi A, Appl. Res.*, 1974, **26**, (1), 167-173  
Measurements of the heat capacity of Pd<sub>3</sub>Fe in the ordered and disordered states at 2-8 K showed a great decrease of the  $\gamma$ -coefficient of electronic heat capacity with increased long-range order parameter. Charging of the ordered sample with H does not influence the magnitude of  $\gamma$ . As the reason for the observed change of  $\gamma$  a strong change of the *d*-band shape in ordering is assumed.

### The Microstructure and Properties of Sintered TiC-Ruthenium Alloys

R. WARREN and M. B. WALDRON, *Powder Metall. Internat.*, 1975, **7**, (1), 18-21

Sintering behaviour, microstructure, hardness and resistance to cracking studies of TiC-Ru alloys show alloys of full density can be produced by sintering at <1840°C. The alloys are harder than cemented carbides with corresponding fractions of more conventional binder materials such as Ni, but Ru is less effective than Co or Ni in improving the resistance to cracking of TiC.

### Thermodynamic Investigations in the Thorium-Rhodium System

M. MURABAYASHI and H. KLEYKAMP, *J. Less-common Metals*, 1975, **39**, (2), 235-246

The Gibbs free energy of formation of the intermetallic phases existing in the Th-Rh system were determined between 990 and 1170 K by e.m.f. measurements using solid galvanic cells with a CaF<sub>2</sub> electrolyte. Thermodynamic data for the intermetallic actinide-Group VIII metal phases are given.

### A Diffuse Reflectance Study of the Oxidation of Palladium

M. TARDY and F. BOZON-VERDURAZ, *Compt. Rend., Sér. C*, 1975, **280**, (6), 317-320

A study of the oxidation of Pd by oxygen made by diffuse reflectance spectroscopy in the temperature range 20-900°C detected only PdO. The three absorption bands observed at 435, 335 and 260 nm were ascribed to *d-d* transitions.

### Electrical Resistivity and Antiferromagnetism of Chromium-Platinum Alloys

S. ARAJS, K. V. RAO and E. E. ANDERSON, *Solid State Commun.*, 1975, **16**, (3), 331-333

Electrical resistivity ( $\rho$ ) was measured as a function of temperature (*T*) in 0.47, 0.93 and 1.63 at.% Pt-Cr alloys. The onset of antiferromagnetism causes anomalies in the  $\rho$  vs *T* curves which increase with increasing Pt concentrations.

### Some Physical and Mechanical Properties of Uranium-(0.05-6 at.%) Ruthenium Alloys

F. H. HAMMAD and A. A. AROU-ZAHRA, *J. Less-common Metals*, 1975, **40**, (1), 79-90

The thermal expansion, crystalline lattice parameters, density and microhardness of U-Ru alloys with 0.05 to 6 at.% Ru have been studied in the as-cast state and as oil quenched from 720 and 900°C. The results are reported.

### Field Dependent Susceptibility and Localised Spin Fluctuations in PdRhNi Alloys

R. W. COCHRANE, F. T. HEDGCOCK, J. P. TIDMAN and M. J. ZUCKERMANN, *Can. J. Phys.*, 1975, **53**, (2), 145-150

Low temperature magnetisation measurements have been made on a series of Ni-Rh-Pd alloys containing 1-7 at.% Rh and up to 1 at.% Ni in magnetic fields up to 55 kOe. The results indicate a critical concentration of Ni for ferromagnetism close to 2 at.%.

### Superconductivity in Metastable Pd-Alloys Produced by Ion Implantation at Low Temperatures

B. STRITZKER and J. BECKER, *Phys. Lett.*, 1975, **51A**, (3), 147-148

Superconductivity has been observed in Pd after implantation of H at liquid He temperatures with a maximum transition temperature *T*<sub>c</sub> of 9 K. Replacing H by D gave a maximum *T*<sub>c</sub> of about 11 K. Pd also became superconducting after the implantation of B and C.

## CHEMICAL COMPOUNDS

### Complexes of Rh(III), Ir(III), Pd(II), Pt(II) with Dimethyl(1-naphthyl)arsine

L. SINDELLARI, L. VOLPONI and B. ZARLI, *Inorg. Nucl. Chem. Lett.*, 1975, **11**, (5), 319-322

Studies were made of the reaction products of the analogous dimethyl(1-naphthyl)arsine (L) with Rh(III), Ir(III), Pd(II), Pt(II) to investigate the ability of this ligand to form internally metallated compounds. Rh and Ir gave octahedral complexes of formula MX<sub>3</sub>L<sub>2</sub> (M = Rh and Ir; X = Cl or Br) but no metallated compounds were prepared. After refluxing in 2-ethoxyethanol, Ir complexes gave mixtures of inseparable metallated and unmetallated products. Pt complexes gave metallated compounds PtX(As-C)L where As-C = C<sub>10</sub>H<sub>6</sub>AsMe<sub>2</sub>; X = Cl, Br or I.

### Thermal Expansion of the One-dimensional Conductor $K_2Pt(CN)_4Br_{0.3} \cdot xH_2O$ and $K_2Pt(CN)_4 \cdot xH_2O$

W. STURM, S. DROSDZIOK and H. HAPP, *Solid State Commun.*, 1975, **16**, (5), 485-487

Measurements of the thermal expansion coefficient of  $K_2Pt(CN)_4Br_{0.3} \cdot xH_2O$  and  $K_2Pt(CN)_4 \cdot xH_2O$  show a large anisotropy of the a- and c-directions. Their temperature dependence is described by a simple Grüneisen theory. In the range 80-330 K no anomaly is found.

### Reactions of Metal Complexes. Rearrangement Reactions of Bromotrifluoroethylenebis(substituted Phosphine)-Platinum(II)

V. A. MUKHEDKAR, B. J. KAVATHEKAR and A. J. MUKHEDKAR, *J. Inorg. Nucl. Chem.*, 1975, **37**, (2), 483-485

Studies of the vinyl rearrangement of  $(Ph_2PMe)_2Pt(C_2F_3Br)$  and  $(Ph_3P)_2Pt(C_2F_3Br)$  show that the rearrangement takes place through an addition intermediate, probably with a trigonal bipyramidal configuration. This reaction is used in the synthesis of a new series of complexes with the formula  $(Ph_2McP)_2Pt(CF=CF_2)X$  and  $(Ph_3P)_2Pt(CF=CF_2)X$  with  $X = SCN^-$ ,  $NO_2^-$  and  $NO_3^-$ .

### Synthetic Methods in Transition Metal Nitrosyl Chemistry

K. G. CAULTON, *Coordination Chem. Rev.*, 1975, **14**, (6), 317-355

A comprehensive review is given of all methods available for introducing the nitrosyl functionality into Pt metal group and other coordination complexes. (253 refs.)

### Coordination Polymers $M(II)[Pt(CN)_6]$ , I. Preparation, Crystal Lattice and Absorption Spectra

H. SIEBERT and M. WEISE, *Z. Naturf.*, 1975, **30B**, (1/2), 33-39

Hexacyanoplatinates (IV)  $M(II)[Pt(CN)_6] \cdot xH_2O$  ( $M(II) = Mg, Ca, Cr, Mn, Fe, Co, Ni, Cu, Zn, Cd$ ;  $0 \leq x \leq 2$ ) have been prepared and a new simple method to prepare  $K_2[Pt(CN)_6]$  developed. X-ray studies show the structure of the compounds to be cubic except for the Cr and Cu salts which are tetragonal. Absorption spectra data for the compounds have been obtained.

### The Free Energy of Formation of Iridium Oxide by Solid Electrolyte Galvanic Cell

E. S. RAMAKRISHNAN, O. M. SREEDHARAN and M. S. CHANDRASEKHARALAH, *J. Electrochem. Soc.*, 1975, **122**, (3), 328-331

The value of  $\Delta G^0_f$  of  $IrO_2(s)$  was determined between 875 and 1175 K by the solid oxide electrolyte galvanic cell method, using calcia-stabilised zirconia as the electrolyte. The results enable estimates of Ir loss from Ir-Pt alloys at high temperatures to be made and allowed for.

## ELECTROCHEMISTRY

### Adsorption of Hydrogen on Skeleton Rho-dium-Zirconium Electrode Catalysts

M. V. AVRAMENKO, V. M. TSINTSEVICH and G. P. KHOMCHENKO, *Zh. Fiz. Khim.*, 1975, **49**, (2), 457-461

Charging curves of  $H_2$  adsorption in 0.1 N  $H_2SO_4$  on 0-100 wt.% Zr-Rh electrodes showed that adsorption decreases with increased Zr content. The amount of  $H_2$  adsorption on 5 and 40 wt.% Zr-Rh electrodes decreased with increased temperature, on pure Zr at 20-60°C there is little change, and at 80°C on pure Zr the length of the  $H_2$  region of the charging curve increases.

### On the Reduction of Oxygen at Platinum-Oxygen Alloy Diaphragm Electrodes

J. P. HOARE, *Electrochim. Acta*, 1975, **20**, (4), 267-272

The kinetics of the reduction of  $O_2$  on the front side of a Pt foil diaphragm has been studied both before and after the back side had been anodised. Strong anodisation converts the Pt to a Pt-O alloy and the results show how the presence or absence of  $O_2$  in Pt can affect the processes.

### The Adsorption, Desorption, and Exchange Reactions of Oxygen, Hydrogen, and Water on Platinum Surfaces. II. Hydrogen Adsorption, Exchange and Equilibration

Y. K. PENG and P. T. DAWSON, *Can. J. Chem.*, 1975, **53**, (2), 298-306

The adsorption, desorption, exchange and equilibration reactions of  $H_2$  and  $D_2$  on a Pt filament have been studied by thermal desorption mass spectrometry. The results show that for polycrystalline Pt surfaces heterogeneity is important for the exchange and equilibration reactions of  $H_2$ .

### Contribution to the Study of the Oxygen Electrode on Platinum in Alkaline Solution

M. APPEL and J. APPLEBY, *Compt. Rend., Sér.C*, 1975, **280**, (9), 551-554

A study has been made of the  $O_2$  reduction on Pt in alkaline solution using the rotating ring-disc electrode method. The pH dependence of the process has enabled the rate-determining steps for the formation of  $H_2O$  and  $H_2O_2$  to be identified.

### The Reaction of Hydrogen Atoms with Palladium and its Alloys

W. A. OATES and T. B. FLANAGAN, *Can. J. Chem.*, 1975, **53**, (5), 694-701

It has been found that when H atoms generated in the gas phase are allowed to interact with Pd quite high concentration of interstitial  $H_2$  can be introduced, even in the absence of poisons. The kinetics of the uptake and subsequent loss of  $H_2$  from the Pd are considered.

## ELECTRODEPOSITION AND SURFACE COATING

### A Practical Approach to the Plating of Platinum Group Metals

A. J. FOSTER, *Electroplating Metal Finish.*, 1975, **28**, (1), 8-13; (2), 15-17

The plating of Pt group metals is described and typical solutions for their deposition given. Trends in Pt plating and its applications in the electrical and electronics industries are discussed.

## LABORATORY APPARATUS AND TECHNIQUE

### The Detection and Estimation of Airborne Sulphur-containing Compounds by Means of a Novel, Dry, Ultra-rapid, and Extremely Sensitive Method

R. W. PIERCE, *I.S.A. Trans.*, 1974, **13**, (4), 291-295

A new instrument system is described which utilises the reversible and sensitive surface 'poisoning' of H permeable Pd metal membranes or foils by S compounds to measure total S in air or other sources.

### Automatic Dew Point Mirror for Air Conditioning

R. GASSER, *Sulzer Tech. Rev.*, 1974, **56**, (4), 214-220

An automatic dew point mirror hygrometer incorporating Pt resistance thermometers developed to meet the most exacting demands of air conditioning is described.

### A Four Point-probe Cell for Resistivity Measurement at High Temperature

A. M. GEORGE and I. K. GOPALAKRISHNAN, *J. Phys. E: Sci. Instrum.*, 1975, **8**, (1), 13-15

A four point probe cell for measuring electrical resistivity of semiconducting compounds at high temperature was fabricated using 40% Rh-Pt pins on a Zr block as the probe assembly. Resistivities from 0.1-10<sup>8</sup> Ω can be measured against temperature with an accuracy of 3-0.5%.

## HETEROGENEOUS CATALYSIS

### Estimation of Platinum Catalyst Requirement for Ammonia Oxidation

D. ROBERTS and G. R. GILLESPIE, *Adv. Chem. Ser.* **133**, 1974, 600-611

Mass transfer coefficients for stacked metal screens are used to estimate the amount of Pt catalyst required for satisfactory operation of a commercial NH<sub>3</sub> burner, despite the temperature gradients present in the Pt catalyst pad and the usual surface rearrangement of the Pt. Calculations indicate that operation at a higher mass velocity or with closer mesh screens woven from finer wire would reduce catalyst requirement.

### The Effect of Additions of Rhenium on the Activity and Thermal Stability of Platinum/Alumina Catalysts in the Dehydrogenation of Cyclohexane

N. S. KOZLOV, E. A. SKRIGAN, M. V. ZARETSKII and G. A. ZHIZHENKO, *Neftekhimiya*, 1975, **15**, (1), 69-73

Studies of the dehydrogenation of cyclohexane over Pt/Al<sub>2</sub>O<sub>3</sub> showed that, for 0.5% Pt/Al<sub>2</sub>O<sub>3</sub>, Re additions have little effect on catalyst activity but increase the thermal stability, whereas for 0.01-0.1% Pt/Al<sub>2</sub>O<sub>3</sub> the addition of Re increases catalytic activity. Re causes the dispersion of Pt particles to increase and retards their aggregation during heating.

### Hydrodealkylation of Toluene on Platinum Group Metals

V. N. MOZHAIKO, G. L. RABINOVICH, G. N. MASLYANSKII and L. P. ERDYAKOVA, *Neftekhimiya*, 1975, **15**, (1), 95-100

Studies of the hydrodealkylation of toluene over Pt group metals on γ-Al<sub>2</sub>O<sub>3</sub> at 350-560°C, atm. pressure, showed that at 490°C the order of activity is Rh>Ir>Os>Pd>Ru>Pt. The selectivity of dealkylation depends on the nature of the metal and for toluene conversions up to 50% varies from 99 to 80 mol.% over the series. Determinations of the activation energies for each metal indicated an inverse relationship between activation energy and heat of sublimation.

### Characterisation of Some Supported Metal Catalysts by Alkene Titration

G. C. BOND and P. A. SERMON, *React. Kinet. Catal. Lett.*, 1974, **1**, (1), 3-6

The method of characterisation of Pt on supports by alkene titration is based on the reaction of an alkene with H absorbed on certain pre-reduced supported metal catalysts; the reaction occurs on the metal particles. The technique is applied successfully to the characterisation of Pt/SiO<sub>2</sub> and Pt/α-Al<sub>2</sub>O<sub>3</sub> catalysts at 100°C, but its application to Pt/γ-Al<sub>2</sub>O<sub>3</sub> is complicated by retention and cracking of 1-pentene.

### Effect of the Nature of the Hydrogenation Catalysts on the Selectivity of Hydrogenation of Mixtures of Olefins

N. B. DOBROSERDOVA, A. I. LEONOVA and I. V. GOSTUNSKAYA, *Neftekhimiya*, 1975, **15**, (1), 57-61

Studies of the hydrogenation of binary mixtures of olefins with 2- and 3- substituted double bonds over Pt and Pd blacks showed that with Pt, which has low activity for double bond transfer, the selectivity of hydrogenation is related only to the structure of the olefins in the initial mixture. With Pd, which has high activity for isomerisation, the selectivity is related to the structure of the olefins formed by isomerisation of the initial hydrocarbons and to the amount of isomerisation.

### Role of Olefins in the Hydrogenolysis of Butanes on a Platinum Catalyst

A. SÁRKÁNY, L. GUCZI and P. TÉTÉNYI, *React. Kinet. Catal. Lett.*, 1974, **1**, (2), 169-173

Studies of the reaction of 2-methylpropane in presence of He and H<sub>2</sub> over Pt black catalyst at 370°C showed a decrease in the activity of Pt catalyst in He. The effect of the decreasing catalytic activity was overcome by using an oxidation-reduction cycle between the runs. The formation of olefins is strongly obstructed even by the presence of a small amount of H<sub>2</sub> and thus the subsequent rate of hydrogenolysis increases.

### The Influence of Ionising Radiation from a Nuclear Reactor on the Activity of Palladium Catalyst on a Support

D. V. SOKOL'SKII, B. T. NADYKTO, E. I. GIL'DEBRAND, M. M. NOVIKOVA and E. A. BOGDANOVA, *Kinet. Kataliz.*, 1975, **16**, (1), 156-161

Studies of 0.5% Pd on spectrally pure  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> modified by HF and LiOH after irradiation by neutrons and  $\gamma$ -rays from a nuclear reactor showed that exposure to a beam of 10<sup>16</sup> neutrons/cm<sup>2</sup> or more causes increased catalytic activity of 0.5% Pd/Al<sub>2</sub>O<sub>3</sub> in the liquid phase hydrogenation of dimethylethynylcarbinol. Exposure of the modified  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> reduces catalytic activity. The possible mechanism of radiation modification of catalyst supports is considered.

### Investigation of the Efficiency of Pd/Zelite Catalysts in the Hydrogenation of Dimethylethynylcarbinol. I. Activity of Pd/Zelite Catalysts Produced by the Method of Impregnation

N. A. GOGOL', N. L. SHLIOMENZON and D. V. SOKOL'SKII, *Zh. Fiz. Khim.*, 1975, **49**, (2), 337-339

Studies at room temperature and atmospheric pressure of the efficiency of Pd-impregnated CaA and CaX zeolites in catalysing liquid-phase hydrogenation of dimethylethynylcarbinol showed that, whereas the zeolites themselves do not possess hydrogenating properties, the efficiency of the Pd catalyst reaches maxima at 0.3-0.4% and at somewhat higher metal concentrations. The maxima are caused by single Pd atoms, like those of Pt, in the first case and, perhaps, the onset of Pd crystallisation at 0.8-0.9% Pd.

### II. Efficiency of Pd/Zelite Catalysts Produced by the Cation Exchange Method

N. A. GOGOL', D. V. SOKOL'SKII and L. D. ZHUBANOVA, *Ibid.*, 340-342

The activity and efficiency of Pd/NaY zeolite was studied under mild conditions. Pd was supported on the outside and was introduced into the zeolite by cation exchange. Catalyst activity for hydrogenation of dimethylethynylcarbinol depends on the amount of Pd. Single atoms of Pd appear active up to 0.6% Pd content.

### Noble Metal Catalysts for Non-selective Oxidation and Pollution Control

E. J. SERCOMBE, *Chem. & Ind.*, 1975, (4), 157-161

A comprehensive review is given of the uses of noble metal catalysts, supported and non-supported, in non-selective oxidation and pollution control. The reactions of interest were classified according to whether the material oxidised is inorganic, H<sub>2</sub> itself, or organic. The use of "Honeycat" Pt catalyst in a wire enamelling plant is described.

### Hydrocracking of *n*-Butylbenzene, *sec*-Butylbenzene and Benzene with Palladium on Silica-Alumina Catalysts

C. J. EGAN, *J. Catalysis*, 1975, **36**, (3), 313-319

Studies of 0.3% Pd/SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> catalysts during the hydrocracking of *n*-butylbenzene, *sec*-butylbenzene at 82 atm. and 10 moles H<sub>2</sub>/hydrocarbon show that some of these catalysts lose activity for complete hydrogenation in about 40h, and in 100h in the case of benzene. In contrast to *n*-butylbenzene, the level of dealkylation of *sec*-butylbenzene remains high at 95% because the Pd is still effective in preventing poisoning of the acid sites. The results suggest that intermediate species generated on the acid sites of SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> migrate to Pd sites and cause deactivation.

### Reduction of Nitric Oxide by Monolithic-supported Palladium-Nickel and Palladium-Ruthenium

C. H. BARTHOLOMEW, *Ind. Engng. Chem., Product Res. Dev.*, 1975, **14**, (1), 29-33

Laboratory reactor studies of the performance of monolithic-supported Pd-Ni and Pd-Ru alloys in reducing NOx showed promising results although long term stability is a problem. Performance is influenced by temperature, poisons, reactant concentrations and changes in space velocity.

### Electrocatalysis on Binary Alloys. I. Oxidation of Molecular Hydrogen on Supported Pt-Rh Alloys

P. N. ROSS, K. KINOSHITA, A. J. SCARPELLINO and P. STONEHART, *J. Electroanal. Chem. Interfac. Electrochem.*, 1975, **59**, (2), 177-189

Investigation of Rh-Pt alloys supported on graphitised C used as electrocatalysts for the electrochemical oxidation of H<sub>2</sub> in CO/H<sub>2</sub> gas mixtures showed a maximum catalytic activity at 24at.% Rh. This corresponds to minimum activation energy and maximum paramagnetic susceptibility. Poisoning of the alloy surfaces by CO varied only slightly with alloy composition.

### Catalyst Screens

C. HAMANN, *Wire*, 1975, **25**, (Mar.-Apr.), 52-53

Pt and Rh-Pt catalyst gauzes can now be produced up to 5000 mm wide on weaving machines specially developed for the purpose.

## Platinum Adsorption Catalysts in Vapour-phase and Liquid-phase Hydrogenation of Cyclohexene

N. I. KOBOZEV, ZH. V. STREL'NIKOVA and L. E. MARTYSHKINA, *Vest. Moskov. Univ., Ser. II, Khim.*, 1975, **16**, (1), 23-25

Pt/SiO<sub>2</sub> catalysts possessed considerably higher activity in the vapour-phase hydrogenation of cyclohexene than in the liquid-phase hydrogenation. Lower activity in the latter case is connected with solvent effects.

## HOMOGENEOUS CATALYSIS

### Differences between Homogeneous and Heterogeneous Metal Catalysts. Isotope Orientation in the Platinum-catalysed Exchange of the Polyphenyls, Particularly *o*-Terphenyl

K. P. DAVIS and J. L. GARNETT, *J. Chem. Soc., Chem. Commun.*, 1975, (3), 79-80

Studies of the isotope orientation in Pt-catalysed exchange of the polyphenyls, other than *o*-terphenyl, showed the deactivation of all *ortho* positions to *meta* and *para* isotope incorporation species during initial deuteration. By contrast, *o*-terphenyl shows the expected *ortho* deactivation with homogeneous PtCl<sub>4</sub><sup>2-</sup> and on heterogeneous Pt, all *ortho* protons of the centre ring exchange readily during the initial stages of the reaction. The difference in deuterium orientation of *o*-terphenyl is attributed to particular conformation of *o*-terphenyl in the adsorbed state.

### Liquid Phase Oxidation of Benzaldehyde Catalysed by Low-valent Transition Metal Complexes

J.-I. HOJO, S. YUASA, N. YAMAZOE, I. MOCHIDA and T. SEIYAMA, *J. Catalysis*, 1975, **36**, (1), 93-98

Catalytic studies of d<sup>8</sup> and d<sup>10</sup> noble metal complexes during the oxidation of benzaldehyde to benzoic acid and perbenzoic acid showed that the catalytic activity of the complex catalysts was in the order of RhCl(CO)(PPh<sub>3</sub>)<sub>2</sub> > PdO<sub>2</sub>(PPh<sub>3</sub>)<sub>2</sub> ≈ Pd(PPh<sub>3</sub>)<sub>4</sub> > RhCl(PPh<sub>3</sub>)<sub>3</sub> > [RhCl(PPh<sub>3</sub>)<sub>2</sub>]<sub>2</sub> > IrO<sub>2</sub>Cl(CO)(PPh<sub>3</sub>)<sub>2</sub> ≈ PtO<sub>2</sub>(PPh<sub>3</sub>)<sub>2</sub>. From the kinetic studies using PdO<sub>2</sub>(PPh<sub>3</sub>)<sub>2</sub>, the initial rate of O consumption was described.

### On the Selectivity in the Catalytic Hydrogenation of Methylacetylene on Group VIII Metals

N. YOSHIDA and K. HIROTA, *Bull. Chem. Soc. Japan*, 1975, **48**, (1), 184-190

The reaction of methylacetylene with H<sub>2</sub>, and with D<sub>2</sub>, was studied over Pd, Pt, Rh, Ir and Ru at 25°C and Pd was found to be the most selective for C<sub>3</sub>H<sub>6</sub> formation. With Ru the isomerisation of methylacetylene to allene occurred simultaneously with the hydrogenation. Only three H atoms were deuterated in the C<sub>3</sub>H<sub>6</sub> produced over Pd and Pt.

## CHEMICAL TECHNOLOGY

### Corrosion Behaviour of Platinum-Titanium Contacts in Aggressive Medium

S. S. MARKOV, G. A. SERYSHEV, V. G. FOMICHEV, A. F. KOPYLOVA, and S. V. OTTAS, *Zashchita Metal.*, 1975, **11**, (1), 50-52

Studies of the corrosion behaviour of Pt-Ti alloys made in HClO<sub>4</sub> and HCl solutions, at 18-23°C and electric potential of 1.05-1.2 V showed the lowest corrosion resistance for 69-78% Pt-Ti alloy in 500g/l HClO<sub>4</sub> and 10g/l HCl and electric potential of 1.05-1.1 V. This low corrosion resistance for Pt-Ti alloys is explained.

### Corrosion Resistance of Titanium-Ruthenium Alloys

A. J. SEDRIKS, *Corrosion*, 1975, **31**, (2), 60-65

The corrosion resistance of various Ti-Ru alloys (0.07-0.55 wt.% Ru) were evaluated and compared with published data on Ti-Pd alloys. The results showed that the corrosion resistance of Ti-Ru alloys were equivalent to that of Ti-Pd alloys in boiling 0-10% H<sub>2</sub>SO<sub>4</sub> solutions, and only slightly inferior in boiling 0-10% HCl solutions. The Ti-Ru alloys, however, picked up less H during corrosion than Ti-0.2% Ru alloy. It is proposed that in H<sub>2</sub>SO<sub>4</sub> solutions, the passivating mechanism involves dissolution and re-precipitation of Ru.

## ELECTRICAL AND ELECTRONIC ENGINEERING

### New Tri-metal Process Brings Hermeticity to Plastic-packaged ICs

*Electronics*, 1975, **48**, (9), 29-30

RCA states that a new process utilising thin layers of Pt, Au and Ti has been developed to prevent corrosion caused by moisture in plastic-packaged integrated circuits. Initial tests over 14,000 hours at 27°C and a relative humidity of 90-98% produced no failures.

## TEMPERATURE MEASUREMENT

### Application of High Temperature Film Thermocouples in Investigations of Temperature Fields of Components of Gas Turbine Engines

L. S. GRIGOR'EV and D. F. SIMBIRSKII, *Tepl. Napryazh. Elem.Konstr.*, 1974, **14**, 137-139

Thermoelectric and stability studies were made of the Pt-refractory materials annealed at 20-1000°C, and the thermo-e.m.f. of thermocouples built from these materials were compared with the thermo-e.m.f. of Pt:Rh-Pt thermocouples. The thermo-e.m.f. stability was characterised by  $\delta$  dispersion and for almost all alloys  $\delta$  was ~0.5%. The influence of microstructure changes on thermo-e.m.f. is also evaluated.