ABSTRACTS

of current literature on the platinum metals and their alloys

PROPERTIES

High Temperature Creep of 40% Rh-Pt Alloy
Creep tests on 40 wt.% Rh-Pt in vacuum at 1160-1750°C with applied stresses of from 0.5 to 6.0 kg/mm² showed that the alloy behaves similarly to the pure metals.

Low Temperature Thermophysical and Mechanical Properties of High Purity Platinum-25 wt.% Iridium Alloy
R. J. POLEY and F. J. JELINEK, U.S. Rept. UCRL-75575, 1974, (Feb.), 8 PP.
The low temperature properties of 25% Ir-Pt alloy were studied at 4-300 K using a fused silica dilatometer. The values of thermal contraction and conductivity, as well as tensile strength at 300 K and 20 K are given.

Influence of Thermomechanical Treatment on the Tensile Properties of a Platinum-25 wt.% Iridium Alloy
25% Ir-Pt alloys, synthesised by arc melting and hot worked at 1343°C, were tensile tested under two different conditions of cold work following a water quench from the hot-work temperature. Results show an absence of work hardening and a significant reduction in yield strength with increasing cold work and, by adding an ageing step of 5 h at 700°C, significant strength increases were obtained. The maximum strength for 25% Ir-Pt alloy was achieved by series of cold-work and ageing operations.

Elastic Constants of Fe-Pt Alloys. I. Single Crystalline Elastic Constants of Fe₇₂Pt₂₈. II. Young’s Modulus of Fe-Pt (25-29% Pt)
The elastic constants Cᵣ of a disordered Fe₂₈Pt₇₂ single crystal measured as a function of temperature show that Cᵣ goes through a minimum at 50°C and that a magnetically induced reduction is present up to 200°C above Tᵣ. Results are also presented for the temperature dependence of Young’s modulus of 25-29% Pt-Fe alloys in the ordered and disordered states.

Platinum Silicide Formation: Electron Spectroscopy of the Platinum-Platinum Silicide Interface
Electron spectroscopy studies were made of the interface between the Pt metal and PtSi formed by d.c. sputtering and filament evaporation. The results show that, after sintering in N₂, the PtSi is separated from Pt metal by a “protective” layer identified as Pt₅Si₃O₆. This layer has a significantly slower etch rate in standard etchants than Pt metal and PtSi, and is formed during sintering by an interaction between Pt metal and SiO₂.

On the Constitution of the Mixture Platinum-Gallium and Platinum-Gallium-Germanium
Phases PtₓGaₙ₋ₓ, PtₓGaₙ₋₅, PtₓGaₕ, PtₓGaₙ₋₁₋₅, PtₓGa₉ and PtₓGaGe were studied and their crystal structures were determined.

Initial Sintering of Palladium Powder Compacts
Compacts of 0.06 μm Pd powder vacuum sintered at 300-550°C showed shrinkage kinetics which agree with a model based on grain boundary diffusion. Spherical Pd powder 60-525 μm was sintered at 1510°C in air. The initial sintering kinetics correlate well with volume diffusion kinetics.

Effect of Short Range Order on Mechanical Properties of Alloys
M. E. NICHOLSON, U.S. Rept. COO-1009-10, 1974, 8 PP.
Study was made of the anomalous electrical resistivity behaviour of Ag-Pd and Au-Pd alloys on cold working and annealing. The anomalous behaviour was explained on the basis that cold working destroyed short range order.

Concentration Dependence of the Superconducting Transition Temperature in PdHₓ and PdDₓ
Studies of an inverse isotope effect between homogeneous bulk PdHₓ and PdDₓ showed that maximum x values achieved by high-pressure charging were 0.99 and 0.97 for the hydride and
the superconducting transition temperature of PdH and PdD are 8 and 10 K, respectively.

Absorption of Hydrogen by Substitutional fcc Lead/Palladium Alloys
Studies of the H absorption of a series of substitutional f.c.c. Pb-Pd alloys show that the relative partial molar enthalpies of absorption at infinite dilution decrease with Pb content of the alloys. Lattice parameters of the H-containing alloys showed that the second, β-phase, does not form at substitutional Pb contents > 8.5 at. % (298 K).

Study of the Kinetics and Mechanism of the Strengthening of Mn-Pd Alloys
Studies of the γ-Mn phase of 5, 10, 15, 20, 30 and 66%, Pd-Mn alloys during their annealing for 1-10 min at 450-600°C in HCl show that 30% Pd-Mn alloy has the highest strengthening coefficient and good corrosion properties.

An Investigation of the Structure of Pd₃Si Formed on Si
Studies of the structure of the as-deposited Pd films and the silicide films formed on Si substrates of various orientations, and their possible relationship with the transformation kinetics of the Pd₃Si phase showed that the lattice diffusion of materials through the Pd₃Si layer is the rate-controlling step for Pd₃Si formation.

Thermodynamic Considerations on the Formation and Stability of Metallic Glasses
The formation and stability of metallic glasses of compositions (Pd₁₋ₓMₓ)₀.₈₀P₀.₂₀, (Pd₁₋ₓTₓ)₀.₇₅P₀.₂₅, (Pd₁₋ₓNₓ)₀.₇₅P₀.²₅, (Pd₁₋ₓMₓ)₀.₅₀P₀.₅₀, and (Pd₁₋ₓNₓ)₀.₅₀P₀.₅₀ were studied (where T = Ni, Co and Fe and M = Rh, Au, Ag, Cu, and T). The results show that the admixture of metallic elements of different atomic sizes and strong atomic interactions, which lowers the melting temperature and raised the glass temperature, facilitates the formation of glasses.

Thermal Expansion and Density of Glassy Pd-Ni-P and Pt-Ni-P Alloys
The thermal expansion and density of (Pd₁₋ₓNₓ)₀.₇₅P₀.₂₅, and (Pd₁₋ₓNₓ)₀.₇₅P₀.₂₅ alloys were measured from room temperature to the glass transition temperature Tg. The thermal expansion of the glassy alloys at room temperature varies linearly with x and y and is 10-20%, higher than that of the corresponding pure metals.

Debye Temperature in Noble Metals
The longitudinal and transverse sound velocities and Debye temperatures (θD) were calculated for Au, Ag, Pt, Pd, Ir, Rh, Os, and Ru using their elastic properties. Values of θD for Au, Ag, Pt, Pd, Ir, Rh, Os, and Ru; 164 K, 226 K, 240 K, 300 K, 420 K, 480 K, 500 K, and 660 K respectively, were obtained by calorimetric experiments in the liquid-He range or lower.

The Low Temperature Resistivity of RhFe
Measurements of the resistivity of 0.004-2.2 at. % Fe-Rh alloy at 0.5-30 K showed that magnetic ordering to a spin glass state takes place at low temperatures in alloys containing more than 5% Fe, while at lower concentrations the ground state is nonmagnetic.

Magnetic and Superconducting Properties of the System Mo₇Ir₂Fe₃
Studies show that Fe is magnetic when introduced as an impurity in the A15 super-conductor Mo₇Ir₂. The superconducting properties are explained in terms of standard pair breaking theories including a negative exchange field and the effects of the short range ordering.

Cemented Carbides with High-melting-point Precious Metal-binder Phase
J. S. JACKSON, B. WARRIN and M. B. WALDRON, Powder Metallurgy, 1974, 17, (34), 255-270
Studies of alloy systems consisting of TiC and WC in combination with Ru and Ru-Pd alloys show that in TiC-(Ru, Ni) alloys a small amount of Ni required for effective sintering does not affect the properties of the alloys and that, with this quantity of Ni, the melting point of the binder phase is still significantly higher than that of conventional cemented carbides.

CHEMICAL COMPOUNDS

Interaction of Platinum Compounds with Dinucleotides
Spectroscopic studies of the interaction of a number of Pt complexes with the dinucleotide A₃p5'C, A₂p5'Ε, A₃p5'C, A₂p5'C, and A₃p5'U showed the possibility of a metal ion being chelated to form an interbase link within the dinucleotide. cis-Pt(NH₃)₂Cl₂ and cis-Pt(enim)₂Cl₂ (enim = ethylenimine) form an interbase link with A₃p5'A and A₃p5'Ε.
whereas trans-Pt(NH$_3$)$_2$Cl$_2$ reacts only to bring about unstacking of the dinucleotides.

New Structural Findings from a Neutron Diffraction Study of One-dimensional K$_2$Pt(CN)$_3$Br$_{0.9}$-3H$_2$O

J. M. WILLIAMS, J. L. PETERSEN, H. M. GERDES and S. W. PETERSON,

Single-crystal neutron-diffraction structure studies of K$_2$Pt(CN)$_3$Br$_{0.9}$-3H$_2$O showed it to be noncentrosymmetric (space group P4$_2$mm). The Pt(CN)$_3$-z groups are not precisely planar, the K' ions occupying ordered sites, and two crystallographically different Br- ion sites are observed.

The Crystal Structure of Pd$_6$P

Y. ANDERSSON, V. KAEBWANSILP, M. DEL ROSARIO CASTELEIRO SOTO and S. RUNDQVIST,

X-ray diffraction studies of the crystal structure of Pd$_6$P showed it to be monoclinic with a = 2.837, b = 9.441, c = 7.695 Å and $\beta$ = 90.2°. The structure is closely related to the Re$_6$B-type structure.

The Structure of PdPS and the Crystal Chemistry of Late Transition-metal Diphosphides and Dichalcogenides


Crystal studies of PdPS showed it to be orthorhombic with a = 13.3045, b = 5.6777, c = 5.6932 Å and Z = 8; PdPS forms double nets, thus combining bonding characteristics of PdP$_2$ and PdS$_2$.

ELECTROCHEMISTRY

A Palladium Hydride pH Electrode for Use in Buffered Etch Solutions


Lifetime of Pd electrodes cathodically charged to Pd hydride and stability in NH$_3$F, as well as in NH$_4$SO$_4$, pH3.6 Na citrate and in pH8 (NH$_4$)PO$_4$ are increased by maximising Pd hydride concentration and the electrode volume. Electrode lifetime was measured for 7-14 days for all solutions, which is the longest time ever reported.

Dissolution of Palladium in Various Electrolytes

G. N. VINogradov, N. F. DEDUSHEV, L. P. VERSHININA
and G. P. Suvorova,

Potentiodynamic studies of anodic dissolving of Pd powder on sital blocks with a Ti substrate in aqueous KCl, KBr, KNO$_3$, and KCNS solutions indicated the effects of concentration, electrolyte temperature and increasing potential on the intensity of the electrode processes. Calculated were the activation energy, the pre-exponential factor and the entropy of Pd ionisation.

Electrodeposition and Surface Coatings

Electrodeposition of Palladium-Tin alloy

C. N. VINogradov, N. F. DEDUSHEV, L. P. VERSHININA
and G. P. Suvorova,

Studies of the microhardness and the contact resistance of Pd-Sn alloys electrodeposited on Pt anode in 20% Pd ethylenediamine and Sn pyrophosphate electrolyte at 50-60°C showed that the best soldering alloy is 15% Pd-Sn with high microhardness and with high contact resistance.

Laboratory Apparatus and Technique

Rotating Disc Electrode Technique for a Kinetic Study on the Charge Transfer Reaction between Molten Silicate and Solid Platinum at High Temperature

M. Kawakami and K. S. GOTO,
Metall. Trans., 1974, 5, (10), 2244-2246

Detailed studies of rotating disc electrode technique, the rotating electrode made of Pt disc and 13% Rh-Pt wire being used for the thermocouple, were made to find how to apply this technique to the kinetic study on the charge transfer reaction between solid Pt and molten silicates at high temperature.

Heterogeneous Catalysis

Reaction of Methylcyclopentane and n-Hexane over Evaporated Platinum Film Catalysts

J. R. ANDERSON and K. SHIMOMURA,

Studies of n-hexane and methylcyclopentane reactions over polycrystalline Pt films evaporated in a ultrahigh vacuum condition showed that the initial distribution of reaction products varied with the reaction temperature and the hydrogen/hydrocarbon ratio. The effect of the reaction conditions was interpreted as depending on the possible reaction mechanisms cited.

Thermal Deactivation of a Platinum Monolithic Carbon Monoxide/Hydrocarbon Oxidation Catalyst

S. E. VOLTZ and D. LIEDEWENDT,

The thermal deactivation of a Pt monolith oxidation catalyst was studied at 1400-2400°F. The effects of the thermal treatments on the oxidation of CO, C$_2$H$_6$, C$_3$H$_8$ and engine exhaust gas were measured. The catalysts were characterised by measurement of surface area, CO and H$_2$ chemisorptions, X-ray line broadening, and
X-ray diffraction; scanning electron micrography was used to examine surface morphology. The growth of large Pt crystallites occurred even at 1400°F. Considerable sintering of the Al$_2$O$_3$ washcoat took place above 1800°F, and solid-state phase changes in the ceramic occurred above 2200°F.

Calculation of the Dispersion of Platinum in Platinum/Alumina Catalysts from Oxygen Chemisorption Data

The chemisorption of H$_2$ on Pt and the dispersion of Pt on Al$_2$O$_3$ are related to the chemisorption of O$_2$. The changed stoichiometry of O$_2$ chemisorption on highly dispersed Pt is considered.

Increase in the Stability of Platinum Reforming Catalysts by the Addition of Rhenium

Pt, Re and Cl were applied to Al$_2$O$_3$ for aromatisation of n-heptane. Re was applied as HReO$_4$ obtained by dissolving Re in HNO$_3$. Catalysts containing 0.45–0.55% Pt, 0.2–0.3% Re and 1.2–1.5% Cl had higher stability and resistance to coking than those containing 0.45–0.6% Pt and 0.35–1.2% Cl.

Catalytic Radiant Panels at Low Temperature. I. Characteristic Construction and Functioning. II. Preparation and Pretreatment of Structure at High Dispersion of Active Metal on Fibres of Various Types

Precious metal catalytic radiant flameless heaters operating at low temperature were prepared. Very short preheating time and low unburnt concentrations in gases were achieved with extremely small amounts of Pt/Al$_2$O$_3$ fibre support. Theoretical considerations are reported on the properties of radiant heat transfer of these materials.

Catalytic Cyclotrimerisation of Ethylene into Benzene

Calculations of the thermodynamic equilibria of the cyclotrimerisation of C$_2$H$_4$ and C$_3$H$_6$ and of the cyclodimerisation of C$_2$H$_4$ and C$_2$H$_6$ to C$_6$H$_6$ indicated that over a wide range of temperature at atmospheric pressure the reactions $3\text{C}_2\text{H}_4 \rightarrow 2\text{C}_6\text{H}_6 + 3\text{H}_2$ and $2\text{C}_2\text{H}_4 + 2\text{C}_2\text{H}_6 + 3\text{H}_2$ are completed displaced to the right. Five samples of Pt/Al$_2$O$_3$ were studied for activity in cyclotrimerisation of C$_2$H$_4$; the most active was prepared using fluoride-free Al$_2$O$_3$ modified by HNO$_3$ and the yield of aromatics on its reached 11.2% for C$_2$H$_6$ and half as much again for C$_3$H$_6$

The data agree with the supposition that cyclotrimerisation of C$_2$H$_4$ proceeds via intermediate formation of C$_3$C$_6$C$_8$ aliphatic hydrocarbons.

On Features of the Mechanism of Formation of Cyclopentanes on Platinum/Alumina Catalysts

The conversion of 3-methylpentane to 3-methylpentene-2 at 275–400°C on the bifunctional 0.6% Pt/Al$_2$O$_3$ catalyst was studied and showed that, in a stream of H$_2$, cyclisation to methylcyclopentane occurs. C$_2$-dehydrocyclisation is presumed to occur by direct alkane-cyclance closure of the C$_n$ ring.

Investigation of the Activity of Platinum/Alumina Catalysts with Various Contents of the Metal According to the Model Reaction of the Hydrogenation of Benzene

Using vapour-phase hydrogenation of C$_6$H$_6$ as a model reaction, studies showed that catalytic activity of Pt/Al$_2$O$_3$ at 60–110°C depends on the Pt content. Catalytic efficiency is directly proportional to metal content up to 0.6 wt.% Pt but it remains constant above that figure.

The Effect of Elements of Groups II-IV of the Periodic System on the Properties of Platinum Catalysts on Supports in the Aromatisation of Hydrocarbons

Additions of MgO, BaO, B$_2$O$_3$, Al$_2$O$_3$, Sc$_2$O$_3$, CeO$_2$ and ZrO$_2$ increase the activity of Pt/SiO$_2$ in aromatisations of N-hexane and of cyclohexane at atm. pressure by slowing down the growth of Pt crystals, corresponding to a change in the content of the soluble form of Pt in the catalysts. These Group III-IV elements also increase the stability of Pt/Al$_2$O$_3$ during heat treatment and oxidative regeneration.

Investigation of Promoted Platinum-Palladium Catalysts on Silica Supports by the X-ray Structure Method

Crystal sizes, phase compositions and distribution of crystal phases were determined in Pt-Pd/SiO$_2$ promoted by oxides of Al, Zr and Ce. The catalysts were treated in air and H$_2$ at 550°C. No
new phases were formed by promoting additions, only Pt-Pd solid solutions being observed. Unpromoted samples in the amorphous state contain 10% of Pt metals but during promotion this rises to 25–45%.

**Investigation of the Means of Initiating Liquid-phase Oxidation of Cumene in the Presence of Platinum and Palladium Catalysts**

V. I. GARANIN, v. B. KAZANSKII and KH. M. lysts when reduction by H, occurs during heating above 300°C. Treatment in vacuum affects the exchange, was studied by i.r. spectroscopy and dispersion of metallic phases after reduction, *Platinum Metals Rev.*, A. M. SOKOL'SKAYA, A. UALIKHANOVA and T. J. A. BETT, K. KINOSHITA and P. STONEHART, Crystallite Growth of Platinum Dispersed on MINACHEV, Kinet.

**Catalysts with High Dispersed Metals**

with the reactions of O, and H,O, with the under Pressure of Hydrogen in Buffer metals. Initiation of the processes is connected to 25-45%.

**Disclosed that (Pt-H)+ is formed on the surface with the reactions of O, and H,O, with the under Pressure of Hydrogen in Buffer**

Liquid-phase Oxidation of Cumene in the Presence of Platinum and Palladium Catalysts. First products of the liquid phase oxidation of cumene in the presence of Pt and Pd blacks, and of Pt and Pd on Al2O3 or SiO2, are cumene hydroperoxide, dimethylphenylcarbinol and acetophenone. The rate of oxidation on the supported metals is greater than on the pure metals. Initiation of the processes is connected with the reactions of O2 and H2O2 with the catalysts. Formation of radicals via dehydrogenation of hydrocarbons does not occur.

**On the Formation of Platinum/Zeolite Catalysts with High Dispersed Metals**


The thermal decomposition in vacuum of [Pt(NH3)2]+ introduced into zeolites by ion exchange, was studied by i.r. spectroscopy and disclosed that (Pt-H)+ is formed on the surface when reduction by H2 occurs during heating above 300°C. Treatment in vacuum affects the dispersion of metallic phases after reduction.

**Crystallite Growth of Platinum Dispersed on Graphitised Carbon Black**


The growth of Pt crystallites supported on C during heat treatment was studied in the terms of models assuming surface diffusion of the crystallites (Smoluchowski model) and migration of Pt atoms for the rate determining steps. The studies show that the sintering of Pt/C can be determined in terms of a Smoluchowski mechanism in which crystallites migrate from trap sites on the support and coalesce on the C surface.

**Hydrogenation of Hexyne-1 on Pt Black under Pressure of Hydrogen in Buffer Solution**


Studies of the hydrogenation of hexyne-1 on Pt black in universal buffer solution at pH values 2.7, 6.5 and 13.8 showed that the process is not selective and that it is not accompanied by isomerisation or by cis-trans conversion.

**Reactions of Hydrocarbons on Palladium-Gold Alloys**


Studies of Pd and Pd-Au catalysts during the hydrogenation of acetylene and reactions of hexane show that alloying increases the selectivity for nondestructive reactions of hexane, and the activity in hydrogenation of acetylene as a function of alloy composition shows a maximum.

**Catalytic Reduction. III. Hydrogenation of Unsaturated Compounds over Borohydride Reduced Palladium**


Studies of borohydride reduced Pd as a hydrogenation catalyst showed no hydrolyses of N and O groups a-bonded to C in alcohols, amides, amines, esters, ethers, or lactones. Borohydride reduced Pd catalyst was selective in catalysing only the reduction of the N-N = bond in azobenzene.

**Mechanisms of Isomerisation and Hydrogenolysis of Hexanes on Palladium-Alumina Catalysts**


The isomerisation and hydrogenolysis of methylpentanes, n-hexane and methylcyclopentane were studied over 10% Pd/Al2O3 catalyst at 250–350°C. Isomerisation of hexanes occurs according to a cyclic mechanism and is demonstrated by the initial product distributions and by 13C labelling experiments.

**Mass Transfer in a Fixed-bed Gas-Liquid Catalytic Reactor with Concurrent Upflow**


Mass transfer coefficients for the hydrogenation of α-methylstyrene were measured in a packed-bed reactor with concurrent gas and liquid upflow; the packing in question was 0.29 cm diameter Pd/Al2O3 spheres. Mass transfer coefficients increase as the 0.5 power of the liquid rate and increase with gas rate to Reynolds No. ≥50. The severe decrease for higher gas rates may be due to pulsating flow.

**The Activation of Palladium Catalysts by Rare Earth and Other Oxides for the Hydrogenation of Cyclohexene**


Studies of the activation of Pd catalysts by rare earth and other oxides made during hydrogenation of cyclohexene in EtOH at 1 atm and 30°C showed that the effect of promoting the catalytic activity...
of Pd decreased in the order: ThO₂ > ZrO₂ > Cr₂O₃ > CeO₂ > TiO₂ > V₂O₅ > La₂O₃ > Pr₂O₃ > Tl₂O₂ > Sm₂O₃. Activation energies observed were higher for the promoted catalysts than for reduced Pd.

Hydrogenation of 2-Methylpentene-2 over Palladium Catalyst


Studies of the kinetics of the conversion of 2-methylpentene-2 over PdS at pH₂ = 30 atm, 75–125°C enabled the rate constants of isomerisation and of hydrogenation to be determined. The limiting stage in the formation of saturated compounds is the reaction of olefins with the catalyst.

Conversion of Alcohols into Unsymmetrical Secondary or Tertiary Amines by a Palladium Catalyst. Synthesis of N-substituted Pyrroles


The Pd-induced reaction of arylmethanols or allyl alcohols with amines provides a useful method for synthesis of secondary or tertiary amines. N-substituted pyrroles can be prepared by the Pd-catalysed reaction of but-2-ene-1, 4-diol with primary amines in excellent yields.

Adsorption and Catalytic Properties of Rhodium


Experimental results on the adsorption of H₂, propargyl alcohol, allyl alcohol, dimethylallylicarbonyl and dimethylvinylcarbonyl on Rh are presented as a function of temperature, concentration of the organic compound in solution and Rh potential.

Reactions of Alkanes on Iridium-Gold Films


X-ray diffraction studies of the conversion of n-hexane and n-butane on Ir-Au films annealed in H₂ for 1 h at 500°C showed peak doubling for 111 and 222 reflections for some alloy compositions, indicating two distinct regions of composition within the metal, while widths of deconvoluted individual peak components indicated homogeneity in these regions.

Interaction between Iridium and Alumina in a Hydrazine Decomposition Catalyst


Spectroscopic studies of the interaction between Ir and γ-Al₂O₃ in a hydrazine decomposition catalyst showed that a part of chloroiridic acid is reduced during the impregnation of Al₂O₃ giving a chlorinated complex of Ir(III) with structure undamaged by H₂ at 400°C. The chemical shifts measured in photoelectron spectra confirm the presence of complexed Ir and show an electronic interaction between uncomplexed Ir and Al₂O₃.

Activation of Nitrogen by Alkali Metal-promoted Transition Metal. III. On the Adsorption of Nitrogen over the Alkali Metal-promoted Ruthenium Catalyst


Studies of adsorption of N₂ and H₂ by alkali metal-promoted Ru on active C were made at 200–300°C and reduced pressures. Extensive N₂ adsorption takes place on Ru-K and Ru-K/C, but not on Ru/C or K/C, which shows that N₂ is first chemisorbed on Ru and migrates to alkali metal.

Perovskites Containing Ruthenium as Catalysts for Nitric Oxide Reduction


Ru ions in the B sites of the perovskite-like ruthenates and manganites ABO₃ (A is La, Pb, Sr, K and B is Ru or Mn ~ up to 10%, Ru) are shown to be very active for NO reduction and losses of Ru by volatilisation are substantially reduced. Ruthenates and Ru ions diluted in AMnO₃ have similar activity but the latter show lower NH₃ production.

Hydrogenation of Xylose over Platinum Group Catalysts


Xylose was hydrogenated with Ru, Rh and Pd catalysts under a wide range of temperatures, pressure, catalyst concentration and agitation rates. The reaction is pseudo-first order and is controlled by the surface reaction between atomic H and unadsorbed Xylose. Kinetic surface parameters were determined for the Ru catalyst.

The Dual State Behaviour of Supported Noble Metal Catalysts


The pretreatment dependent behaviour, which was able to generate two states differing in activity characteristics, was studied on the Ru catalyst, and selectivity changes were compared for Pt, Pd and Ru. S contamination measurements show that the effect is not a simple function of metal loading or dispersion. A mechanism involving surface reconstruction and/or metal-support interaction is proposed.
Aryl and vinylic bromides and iodides, and benzyl chloride react with CO and an alcohol at 100°C and 1 atm in the presence of a tertiary amine and a catalytic amount of a Pd-triphenylphosphine complex to form esters. The reaction shows appreciable stereoselectivity at 60-80°C with cis and trans vinylic halides producing esters with retained configuration.

Complexes of Rhodium with Indigosulphonic Acids and Their Catalytic Properties
The binuclear complex of Rh with anion radicals of indigosulphonic acids is the active form for the catalytic hydrogenation of olefins. Heterogeneous catalysts of this type were produced for hydroformylation and carboxylation of olefins.

Effect of Molecular Nitrogen on Coordination Metal Catalysis. I. Inhibiting Influence of Dinitrogen on the Isomerisation of 1-Methylpentene Catalysed by Dihydrido(dinitrogen)tris(triphenylphosphine)ruthenium
The isomerisation of 1-pentene is catalysed by RuH₂(N₂)(PPh₃)₃ in toluene at 25°C. The kinetic data show that the catalytically active species are RuH₂(PPh₃)₃ in the first isomerisation stage and Ru(PPh₃)₃ in the second stage. The inhibiting effects of N₂ are attributed to the ability of N₂ to compete with the olefin for coordination to the metal.

Homogenous Hydrogenation Using Osmium Complexes
OsCl₂(CO)₂(C₅H₅)₂ catalyst was studied during the hydrogenation of 1-alkenes and of some alkenes with activated double bonds. Stereoselective cis addition of H was demonstrated with suitable model compounds. In some cases the hydrogenation reaction was accompanied by cis-trans or positional isomerisation.

CHEMICAL TECHNOLOGY

Electrochemical and Corrosion Properties of Metal Ceramic Titanium-Palladium Alloy in Hydrochloric Acid Solutions
N. D. TOMASHOV, G. P. CHERNOVA and E. G. MANSKII, Zashchita Metal., 1974, 10, (6), 643-647
Studies of the corrosion resistance of the metal...
ceramic alloys 0.2, 0.4, 1.0 and 10% Pd-Ti made in 20% HCl electrolyte at 0.65 V showed that even the small addition of Pd (0.2-1.0%) in the alloys increased their corrosion resistance by one to two times from that of metal ceramic Ti. The best results were achieved on the metal ceramic alloy 10% Pd-Ti anodes in chlorine ion extraction.

**TEMPERATURE MEASUREMENT**

Balloon-borne Radiosonde for the Measurement of the Atmospheric Thermal Structure Coefficient


The characteristics and operational limits of a balloon-borne radiosonde with Pt wire temperature sensor working up to 20 km for the measurement of the atmospheric thermal structure coefficient $C_T$ are described.

**NEW PATENTS**

**METALS AND ALLOYS**

Contact Material

Fujitsu Ltd. U.S. Patent 3,826,886

A contact material having a high durability is prepared from an alloy consisting of 45-85 at.% Pd and 55-15 at.% Al.

Acoustic Devices Using Amorphous Metal Alloys

Allied Chemical Corp. U.S. Patent 3,838,365

Amorphous layers for use in acoustic alloys have a wide range of compositions but specifically include Pd$_{78}$Ag$_{22}$Si$_{18}$, Pd$_{7}$Cu$_{50}$Si$_{10}$, etc.

**ELECTRODEPOSITION AND SURFACE COATINGS**

Electrically Conductive Composition Element

C.T.S. Corp. U.S. Patent 3,832,308

An electrically conductive composition is mixed with a screening agent, deposited on a substrate and fired at an elevated temperature to form a terminal bonded to the substrate. The composition is a homogeneous mixture of approximately 70-95% co-precipitated Pt-Au alloy particles, co-precipitated Pd-Au alloy particles or co-precipitated Pt-Pd-Au particles and approximately 5-30% of glass frit.

**LABORATORY APPARATUS AND TECHNIQUE**

Alloy Tension Band

FA. Carl Haas British Patent 1,378,835

Tension bonds for measuring instruments are made from alloys containing at least 50% Pd and/or Pt and less than 50% of at least one Group III to VI element (excluding B, C, N, O and the transition elements), e.g. Al, Sb, Te, Sn, Ca. About 1-30% Au, Ag or Cu may also be present. A typical alloy contains 4% Al, 4% Ag, and Pd.

**HETEROGENEOUS CATALYSIS**

Exhaust Catalyst

W. R. Grace & Co. British Patent 1,374,604

Pd and/or Pt on ceramic monolithic catalyst is improved by the presence of a number of linear and parallel passages for gas flow.

Hydrocarbon Isomerisation Catalyst

Universal Oil Products Co. British Patent 1,374,863

Saturated and unsaturated hydrocarbons may be isomerised over a catalyst containing Pt or another Pt metal, a halide, a reaction product of a Friedel-Crafts metal halide and the Al$_2$O$_3$ support, and either a Re component or a germanium component in an oxidation state greater than elementary metal.