

ABSTRACTS

of current literature on the platinum metals and their alloys

PROPERTIES

The Constitution of Ternary Systems: 4th, 5th and 6th Group Transition Metals—Rhenium or Platinum Metals Carbon—Part 2

H. HOLLECK, *Metall*, 1983, **37**, (7), 703–708

Phase diagrams of ternary carbides of Ti, Zr, Hf, V, Nb and Ta with Pt, Pd, Os, Ir, are constructed at temperatures 1300°C, 1500°C, 2000°C; comparisons with ternary Cr, Mo and W carbides are made.

Electrical Properties of Narrow Gap Semiconductor PtSb₂

A. DARGYS and J. KUNDROTAS, *J. Phys. Chem. Solids*, 1983, **44**, (13), 261–267

Results of measurements of conductivity, Hall and Seebeck coefficients on Te doped n-type crystals of PtSb₂ are presented. The Hall coefficient and Seebeck coefficients undergo sign inversion twice, below and above room temperature. Below 200K PtSb₂ can be described by a simple conduction and valence band model. The energy gap, electron conductivity mass, acoustic phonon limited electron mobility and mobility ratio are determined. At higher temperatures a more complicated valence band model is needed to account for the results.

Superconductivity and Critical Field Strengths of Palladium-Boron-Hydrogen Alloys

H. BRODOWSKY and J. FLEISCHHAUER, *Z. Naturforsch., A*, 1983, **38**, (6), 676–679

Transition temperature and critical field strengths have been observed on superconducting Pd-B-H alloys with different B:H ratios. Homogeneous samples, prepared by equilibrium methods, exhibit superconductivity above 3K for B contents less than $x = 0.07$ ($x = \text{mole B} : \text{mole Pd}$). Pd-B alloys need less H for reaching a fixed transition temperature than B free alloys. Critical field strengths for $T_c = 0\text{K}$ increase linearly with increasing B content.

Adsorption of Aliphatic Hydrocarbons C₆ on Pd-Ru Alloy

V. G. DOBKHOTOV, E. A. SHALVASHVILI, L. F. PAVLOVA and V. M. GRYZANOV, *Izv. Akad. Nauk SSSR, Ser. Khim.*, 1983, (7), 1478–1482

Studies of the reversible adsorption of hexane, hexene-1 and hexadiene-1,5 on Pd-6wt.% Ru alloys were made by chromatography at 275–360K. H₂ was found to affect adsorption of n-hexane on the alloys. The increase of partial pressure of H₂ decreased the adsorption in the α -phase in the alloy-hydrogen system and increased it in the β -phase. Adsorption and catalytic surface centres are very different.

How Epitaxial are Pd₂Si-Si Interfaces?

Z. LILIENTAL, R. W. CARPENTER and R. TUENGE, *Thin Solid Films*, 1983, **104**, (1/2), 17–29

Pd₂Si layers produced by evaporation or sputtering onto Si substrates were studied by spectroscopy. The Si/Pd₂Si interfaces produced by evaporation were polycrystalline and rougher than those produced by sputtering. Electrical measurements of the ideality factor for Schottky barriers made from these materials produced higher values for the rougher evaporation formed interfaces, consistent with interface-roughness-induced scattering.

Hydrogen Effects in Metal Catalysts

Z. PAAL and P. G. MENON, *Catal. Rev., Sci. Eng.*, 1983, **25**, (2), 229–324

A comprehensive review is given of effects of H₂ on physical and chemical properties and catalytic activity and selectivity of platinum group metal and gold catalysts. (203 Refs.)

Cross Section for Photoelectron Capture by IrBr₆³⁻ in AgBr

R. J. DERI and J. P. SPOONHOWER, *Appl. Phys. Lett.*, 1983, **43**, (1), 65–67

The lifetime of photogenerated electrons in AgBr crystals doped with Ir³⁺ ions was determined from photoconductivity measurements. The lifetime was short at room temperature, 13–150ps for crystals with 89–4ppm of dopant. This material may be of interest in studying picosecond phenomena in semiconductors. A cross section of $26 \pm 5 \text{Å}^2$ was deduced for photoelectron capture by IrBr₆³⁻ centres.

The Effect of High Pressure on Formation of Intermediate Phases in the System Os-Sn

N. V. KALYAEVA and S. V. POPOVA, *Izv. Akad. Nauk SSSR, Neorg. Mater.*, 1983, **19**, (7), 1106–1109

Studies of the effect of high pressure on the formation of intermediate phases in Os-Sn were made on alloys prepared from powder mixtures of Os and Sn containing 25–75 at.% Sn. The results showed the formation of intermediate phase Os₃Sn₇ at 7.7 MPa pressure and at 900–1600K.

Oxygen-Spinels in Ruthenium and Iridium

B. KRUTZSCH and S. KEMMLER-SACK, *Mater. Res. Bull.*, 1983, **18**, (6), 647–652

In the systems Co-Ru-O and Co-Ir-O cubic spinel type phases of composition Co_{3-x}Ru_xO₄ ($0.4 \leq x \leq 1$) and Co_{2.5}Ir_{0.5}O₄ have been synthesised. The Co can be partially substituted by Fe and Mn (Co_{2.3-y}M_yRu_{0.7}O₄ $0 \leq y \sim 0.7$, M = Mn, Fe) or Cu. A transition from low to high concentration of free electrons can be detected by vibrational spectroscopy.

ELECTROCHEMISTRY

A Study by Electrochemically Modulated Infrared Reflectance Spectroscopy of the Electro sorption of Formic Acid at a Platinum Electrode

B. BEDEN, A. BEWICK and C. LAMY, *J. Electroanal. Chem., Interfacial Electrochem.*, 1983, **148**, (1), 147-160

This work is a first attempt to compare the qualitative results given by EMIRS which is a new spectroscopic technique useful for the "in situ" identification of adsorbed species at the electrode/electrolyte interface, to the quantitative determination of the adsorbed layer, as obtained by conventional electrochemistry. It is shown that so-called CO species detected by EMIRS during the chemisorption of formic acid on a Pt electrode, are the dominant species over a large potential range.

Anodic Characteristics of Amorphous Ternary Palladium-Phosphorus Alloys Containing Ruthenium, Rhodium, Iridium or Platinum in a Hot Concentrated Sodium Chloride Solution

M. HARA, R. HASHIMOTO and T. MASUMOTO, *J. Appl. Electrochem.*, 1983, **13**, (3), 295-306

Amorphous ternary Pd-based alloys containing platinum group metals as an additional element were prepared by rapid quenching from the molten state and their anodic characteristics were studied in NaCl solution of pH 4 and 80°C. The alloys containing sufficient amounts of Rh, Pt or Ir were passivated by anodic polarisation and their corrosion rates at high current densities in the Cl⁻ evolution region were extremely low. The amorphous Pd₄₁Ir₄₀P₁₉ alloy had the desired stable, high electrocatalytic activity for Cl⁻ evolution and high overvoltage for O₂ evolution.

Study of the Kinetic and Reduction Mechanism of OsO₄ by NaBH₄ in Alkali Solution

V. S. KHAIN and A. A. VOLKOV, *Kinet. Katal.*, 1983, **24**, (3), 525-530

A study of the reaction kinetics of OsO₄ with NaBH₄ showed that the process goes through various stages forming Os(VII), Os(VI) and Os(IV). The Os(VI) to Os(IV) reduction stage was the limiting one. A possible mechanism of the process and optimum conditions for obtaining OsO₂ are suggested.

Oxidative Electropolymerisation of Polypyridyl Complexes of Ruthenium

C. D. ELLIS, L. D. MARGERUM, R. W. MURRAY and T. J. MEYER, *Inorg. Chem.*, 1983, **22**, (9), 1283-1291

Polypyridyl complexes of Ru, containing aromatic amine groups, such as [(bpy)Ru(4-pyNH₂)₂]²⁺ (bpy = 2,2'-bipyridine, 4-pyNH₂ = 4-aminopyridine), undergo electrochemically induced oxidative polymerisation. The resulting polymers form fairly stable electrochemically active films on the oxidising electrode, which can be Pt, SnO₂ or vitreous C.

Electrocatalytic Oxidation of Chloride to Chlorine Based on Polypyridine Complexes of Ruthenium

C. D. ELLIS, J. A. GILBERT, W. R. MURPHY and T. J. MEYER, *J. Am. Chem. Soc.*, 1983, **105**, (14), 4842-4843

Spectrometric studies of the chemical and electrochemical oxidation of either (bpy)₂Ru^{II}(OH₂)₂²⁺ or the one-electron oxidised form of the dimer, (bpy)₂(OH)₂Ru^{III}ORu^{IV}(OH)(bpy)₂⁴⁺ (II) in the presence of chloride showed the generation of Cl₂ gas. During electrolysis at a "coarse" (12 holes/linear in.) reticulated vitreous C electrode potentiostated at + 1.20V in ~ 30ml of a 0.05M HCl solution containing 1.35 × 10⁻³ mol of (II), a yield of 1.04 × 10⁻⁴ mol of Cl₂ in 132 min was observed.

PHOTOCONVERSION

Hydrogen Production with Visible Light by Using Dye-Sensitized TiO₂ Powder

K. HASHIMOTO, T. KAWAI and T. SAKATA, *Nouv. J. Chim.*, 1983, **7**, (4), 249-253

H₂ was produced from H₂O by exciting various organic dyes on Pt/TiO₂ or TiO₂ with visible light in the presence of a reducing agent. The quantum efficiency of H₂ production was estimated to be in the order of 10⁻¹ for Ru(bipy)₃²⁺ with EDTA as reducing agent. It is postulated that H₂ is produced by the reduction of H₂O through a dye-sensitised process.

Efficient Hydrogen Production from Water by Visible Light Excitation of Fluorescein-Type Dyes in the Presence of a Redox Catalyst and a Reducing Agent

K. HASHIMOTO, T. KAWAI and T. SAKATA, *Chem. Lett.*, 1983, (5), 709-712

A H₂ production system for visible light without an electron relay, efficient in the high pH region has been constructed with some fluorescein derivatives in the presence of a redox catalyst and a sacrificial reducing agent. The photogalvanic cell was <semiconductor or Pt (light | dibromofluorescein, TEOA | Pt(dark))>; the open voltage was ~800 mV.

Design, Preparation and Characterization of RuO₂/TiO₂ Colloidal Catalytic Surfaces Active in Photooxidation of Water

G. BLONDEEL, A. HARRIMAN, G. PORTER, D. URWIN and J. KIWI, *J. Phys. Chem.*, 1983, **87**, (14), 2629-2636

The preparation and optimisation of RuO₂·xH₂O catalyst obtained by hydrolysis of RuCl₃ on TiO₂ powder are described. The catalyst is active in dark and light-induced sacrificial systems mediating O₂ evolution in solution. The effects of pH, temperature, concentration and other experimental variables affecting the preparation of the catalyst are described. By electron microscopy it is shown that the active catalytic species consists of islands of RuO₂·xH₂O, present as agglomerates of 10-20nm interspersed with TiO₂ particles of 200nm diameter.

Visible Light-Induced Formation of Hydrogen and Thiosulfate from Aqueous Sulfide/Sulfite Solutions in CdS Suspensions

D. H. M. W. THEWISSEN, A. H. A. TINNEMANS, M. EEUWHORST-REINTEN, K. TIMMER and A. MACKOR, *Nouv. J. Chim.*, 1983, 7, (3), 191-194

Cleavage of H_2S into H_2 and S occurs in aqueous suspensions of CdS loaded with RuO_2 upon illumination with visible light. The influence of various anions on this process is presented. Addition of sulphate makes the process very efficient. A 4-fold increase in H_2 production is observed.

Metal Cluster Photocatalysis: Photoinduced Hydrogenation of Ethylene by the Tetraruthenium Cluster Complex $H_4Ru_4(CO)_{12}$

Y. DOI, S. TAMURA and K. KOSHIZUKA, *J. Mol. Catal.*, 1983, 19, (2), 213-222

Near-u.v. irradiation of the $H_4Ru_4(CO)_{12}$ complex in heptane solution induces the catalytic hydrogenation of C_2H_4 in the presence of H_2 at 35°C. The mechanism most consistent with the experimental facts involves photodissociation of CO from the catalyst precursor $H_4Ru_4(CO)_{12}$ as the first step in the catalytic cycle. The properties of photogenerated catalytic species are compared with those of the active species in thermal catalysis by $H_4Ru_4(CO)_{12}$.

ELECTRODEPOSITION AND SURFACE COATINGS

Adhesion and Hardness of Platinum Coatings Electrodeposited from Molten Salts

R. P. WALTERS, M. J. LYNCH and D. R. FLINN, *Plat. Surf. Finish.*, 1983, 70, (5), 91-95

By using a direct-pull solder method, the adhesion of Pt coatings to TZM (0.41% Ti, 0.10% Zr, balance Mo) and Fe₁₀Cr substrates was determined. The average fracture value was 331 MPa with fracture occurring in the substrate or in some combination of the substrate, coating or solder, but not at the deposit/substrate interface, indicating that the true adhesion of the coatings is greater than the measured fracture values. Cross sectional hardness values were dependent on the average grain width, with hardness 50-120HK_{0.05} at 35 and 8μm from the interface.

Studies of Electrodeposition of Thick Films of Bright Palladium Layers

P. A. IUZIKIS and S. I. KNOTIANOVICH, *Zh. Prikl. Khim. (Leningrad)*, 1983, 56, (4), 777-781

Studies of the effect of various additions on the kinetics of the Pd electrodeposition process from ammonium chloride electrolyte showed that adding saccharine and highly sulphurated castor oil to the Pd electrolyte resulted in a greatly increased cathodic polarisation. This allowed the production of low porosity, fine-grained bright layers up to 30μm.

LABORATORY APPARATUS AND TECHNIQUE

Digital Carbon Monoxide Detector/III

J. P. DAUCHOT, A. HECQ and M. T. GROGNIA, *Electrocomponent Sci. Technol.*, 1983, 10, (2 + 3), 151-156

The switch off concentration phenomena in CO oxidation on Pt and the parallel steep variation of resistance or surface potential of thin Pt films have been used to develop a C detector. Coating the Pt film with an increasing thickness of PTFE makes this switch off point move to increasing CO concentrations, therefore a series of electrical elements, Pt thin film resistances, Pt MOS diodes or Pt gas MOS transistors covered by calibrated thicknesses of PTFE can switch off at well determined CO concentrations and form the basis of a digital detector.

Pd/a-Si : H Metal-Insulator-Semiconductor Barrier Diode for Hydrogen Detection

A. D'AMICO, G. FORTUNATO, G. PETROCCO and C. COLUZZA, *Appl. Phys. Lett.*, 1983, 421, (11), 964-965

Hydrogenated amorphous Si produced by the glow-discharge technique was used to construct very low cost, high quality MIS structures using Pd as catalytic metal for H_2 detection. With this device, H_2 concentrations in H_2-N_2 mixture as low as 100ppm were detected. There is an indication that the ultimate limit is much lower.

HETEROGENEOUS CATALYSIS

Pt/Al₂O₃-Cl in Pure Hydrocarbon Reforming

J. N. BELTRAMINI, E. E. MARTINELL, E. J. CHURIN, N. S. FIGOLI and J. M. PARERA, *Appl. Catal.*, 1983, 7, (1), 43-55

The deactivating effects of different paraffins, naphthenes and aromatics were studied during their reforming over a Pt/Al₂O₃ catalyst. The coke formation was found to be directly related to the structure of hydrocarbons or to those of their principal products. The five carbon atom ring was the most important coke precursor for naphthenes. The deactivation effect of coke not only depends on its amount but its effects in different ways on the metallic and the acidic functions of the catalyst.

Reversible Isothermal Sorption of Hydrogen by Tungsten Trioxide in Presence of Platinum

A. R. BERZINS and P. A. SERMON, *Nature*, 1983, 303, (5917), 506-508

The absorption of gaseous H_2 by 3% Pt/WO₃ which forms non-stoichiometric bronze H_xWO_3 ($0 < x < 0.5$) is almost entirely reversible at 273-423K, with molecular H_2 being desorbed with decreasing pressure (0-140kPa). Desorption is preferred to reduction-dehydration.

Ion-Exchange of Amminated Palladium and Platinum in Synthetic Sodium Zeolites

P. FLETCHER and R. P. TOWNSEND, *Zeolites*, 1983, 3, (2), 129-133

The ion-exchange characteristics of amminated Pt(II) and Pd(II) ions in the synthetic zeolites Na-X, Na-Y and Na mordenite were measured. Equilibrium studies were conducted at 25°C. Highly selective isotherms, exhibiting partial exchange, were observed in all cases. For both the $[\text{Pt}(\text{NH}_3)_4]^{2+}$ and the $[\text{Pd}(\text{NH}_3)_4]^{2+}$ ions, the selectivity sequence was observed to be MOR > Y > X. The results are compared with other recent work on ion-exchange in zeolites with amminated transition on noble ions.

Promotion with Adatoms and Microdeposits of Catalysts Used in Electrochemical Energetics Systems

YU. B. VASSILIEV, *J. Res. Inst. Catal., Hokkaido Univ.*, 1983, 30, (2), 89-106

Studies of the influence of various adatoms and microdeposits of Pt, Pd, Ir, Rh, Ru on relatively inert supports (Ti, glass C, pyrographite, Au, Nb, etc.) show that the catalytic effect depends primarily on the mechanism of the electrochemical reaction. The adatom can act either as promoter or poison. With decreasing cluster size on the support, the specific catalytic activity of a single atom in a cluster can both increase (Pt, Ir, Rh on glass carbon and Ti) and decrease (Pd on glass carbon) or remain unaffected (Pd on Nb).

Hydrogenation of Styrene on Pd/ γ -Al₂O₃ and Pd-Mn/ γ -Al₂O₃ Catalysts

I. SANDELESCU, X. YANDONG and V. PIRVELESCU, *Rev. Chim. (Bucharest)*, 1983, 34, (4), 311-313

Studies of chromatographic pulse catalytic hydrogenation of styrene over Pd/ γ -Al₂O₃ and Pd-Mn/ γ -Al₂O₃ catalysts showed that an irreversible reaction of styrene to ethylbenzene which occurred on Pd/ γ -Al₂O₃ was controlled by the Pd concentration. A mechanism of a styrene → ethylbenzene = ethylcyclohexane reaction on the Pd-Mn/ γ -Al₂O₃ catalyst was explained. In both cases, the selectivity of the reaction depended on the transition metal components in the catalyst composition.

On the Selectivity of Palladium Catalysts in Synthesis Gas Reactions

J. M. DRIESSEN, E. K. POELS, J. P. HINDERMANN and V. PONEC, *J. Catal.*, 1983, 82, (1), 26-34

Reactions of CO/H₂ mixtures were studied on a series of 2wt.% Pd/SiO₂ with and without Mg and La promoting additives. The studied promoters affected the activity of the catalysts increasing the selectivity for "oxygenates" and suppressing the selectivity for CH₄. Promoters also create a new type of ionic adsorption centre for CO and NO adsorption. It is concluded that Pd "ions" are the centres for activation of CO toward methanol whereas Pd metal supplies hydrogen atoms for hydrogenation.

Palladium-Tungsten Catalysts for Automotive Exhaust Treatment

K. M. ADAMS and H. S. GANDHI, *Ind. Eng. Chem., Prod. Res. Dev.*, 1983, 22, (2), 207-212

The modification of Pd catalysts with non-noble metal oxides resulted in desirable catalytic activities for Pd-WO₃/ γ -Al₂O₃. The data showed that the Pd-WO₃ catalyst oxidises saturated hydrocarbons with higher conversions than Pt when the synthetic exhaust is reducing. It also selectively reduces NO to N₂, although with lower conversions than Rh.

Fischer-Tropsch Product Distribution for Rh/TiO₂

A. TAKEUCHI, J. R. KATZER and G. C. A. SCHUIT, *J. Catal.*, 1983, 82, (2), 477-478

Studies were made of the total product distribution from CO hydrogenation catalysed by 3.0 wt.% Rh/TiO₂ catalyst at 423K; the catalyst (0.10g) was prereduced at 475K. The large deficit in C₂ hydrocarbons is due to the formation of ethanol. This suggests that a common intermediate may be involved in the formation of hydrocarbons and alcohols from CO + H₂ catalysed by Rh/TiO₂.

Fischer-Tropsch Synthesis of Hydrocarbons on V₂O₅-Supported Ruthenium Catalysts

E. KIKUCHI, H. NOMURA, M. MATSUMOTO and Y. MORITA, *Appl. Catal.*, 1983, 7, (1), 1-9

Hydrogenation of CO was studied on Ru catalysts supported on various transition metal oxides. Ru/V₂O₅ catalysts showed significantly high turnover frequency based on H₂ chemisorption. Product distribution shifted to heavier molecular weight hydrocarbons and a relatively high unsaturate : saturate ratio.

Enhancement of the Methanol Formation from CO and H₂ over Supported Ruthenium Catalysts by the H₂-H₂O Treatment

Y. KOBORI, H. YAMASAKI, S. NAITO, T. ONISHI and K. TAMARU, *Chem. Lett.*, 1983, (4), 553-556

Supported Ru catalysts, which were treated by H₂/H₂O mixture at elevated temperatures, could synthesise methanol with drastically enhanced production from CO and H₂, and with 50% selectivity.

HOMOGENEOUS CATALYSIS

Direct Oxidative Transformation of Aldehydes to Amides by Palladium Catalysis

Y. TAMARU, Y. YAMADA and Z.-I. YOSHIDA, *Synthesis*, 1983, (6), 474-476

The Pd catalysed oxidative transformation of aldehydes to the corresponding morpholine amides, using an oxidation system, Pd(OAc)₂/ArBr/K₂CO₃, is reported. Aromatic and aliphatic were effectively converted, though cinnamaldehyde was not.

Rhodium-Catalysed Low Pressure Hydroformylation of Higher α -Olefins: New, Thermally Stable Rhodium Catalysts by Reaction of $\text{RhH}(\text{CO})(\text{PPh}_3)_3$ with Phosphinous Acids

M. MATSUMOTO and M. TAMURA, *J. Mol. Catal.*, 1983, **19**, (3), 365-367

Rh-catalysed, low pressure hydroformylation of 1-dodecene was restudied in dodecylbenzene solution in the presence of a large excess of PPh_3 . The formation of a new Rh complex, $\text{Rh}_2(\text{CO})_2(\text{PPh}_3)_2(\text{R}_2\text{PO})_2$, which is probably produced by reaction of $\text{RhH}(\text{CO})(\text{PPh}_3)_3$ with the phosphinous acid, improves the thermal stability of the Rh complex in the solution.

Highly Reactive Rh(I) Hydrido Compounds

T. OKANO and T. YOSHIDA, *J. Synth. Org. Chem., Jpn.*, 1983, **41**, (4), 359-364

Three types of Rh(I) hydridotrialkylphosphine complexes, *trans*- $\text{RhH}(\text{N}_2)\text{L}_2$ ($\text{L}=\text{P}(\text{t-Bu})_3$, $\text{PPh}(\text{t-Bu})_2$, PCy_3 , $\text{P}(\text{i-Pr})_3$), $\text{Rh}_2\text{H}(\mu\text{-N}_2)\text{L}_4$ ($\text{L}=\text{PCy}_3$, $\text{P}(\text{i-Pr})_3$) and RhHL_n ($n=3$, $\text{L}=\text{P}(\text{i-Pr})_3$, PEt_3 ; $n=4$, $\text{L}=\text{PEt}_3$) were prepared by reducing $\text{RhCl}_3 \cdot 3\text{H}_2\text{O}$ with Na/Hg in THF. They proved to be extremely strong nucleophiles and were efficient catalysts for hydrogenation of nitriles, ketones and alkynes, and the H-D exchange reaction of H_2 and H-C (sp^2 , sp^3) bond with D_2O through activation of H_2 and H_2O , respectively. They also catalysed the hydrogenation of carbonyl and nitro compounds with H_2O -CO and the hydroformylation of olefins with formaldehyde.

Hydrogenation of Carbon Monoxide by Ruthenium Complexes with Iodide Promoters: Catalytic and Mechanistic Investigations

B. D. DOMBEK, *J. Organomet. Chem.*, 1983, **250**, (1), 467-487

CO and H_2 are converted into organic products, including methanol, ethylene glycol and ethanol, by halide-promoted Ru catalysts in organic solvents. Iodide salts are exceptionally good promoters for this system. Two Ru complexes, $\text{HRu}_3(\text{CO})_{11}^-$ and $\text{Ru}(\text{CO})_3\text{I}_3^-$ are present during catalysis and essential for optimum activity.

ELECTRICAL AND ELECTRONIC ENGINEERING

Pile Up of Implanted Phosphorus during Palladium Silicide Formation and the Characteristics of Schottky Barrier Diodes

A. KIKUCHI, *J. Appl. Phys.*, 1983, **54**, (7), 3998-4000
Schottky barrier diodes, produced from Pd_2Si or Al-Si were fabricated on Si surfaces, whose impurity concentrations were controlled by P ion implantations. The forward voltages of Schottky barrier diodes made from Pd_2Si show a much greater lowering than those made from Al-Si for implanted doses of $5 \times 10^{13}/\text{cm}^2$ and higher. Spreading resistance measurements show that the implanted P atoms are piled up at the $\text{Pd}_2\text{Si}/\text{Si}$ interface during Pd_2Si formation, this reduces the effective barrier height.

NEW PATENTS

METALS AND ALLOYS

Brazing Alloy Containing Palladium

GENERAL ELECTRIC CO. *European Appl.* 76,991

An alloy for use in high temperature gas turbine engines contains 20-80% Pd, 2-13% Cr, 1-4% B, balance Ni, and is free from Si. Its brazing temperature is 982-1093°C. A preferred alloy contains 30% Pd, 10.5% Cr, 2.4% B and 57.1% Ni. The alloys have improved stress rupture properties, good ductility and oxidation resistance and are less expensive than Au alloys.

ELECTROCHEMISTRY

Catalytic Electrode

DIAMOND SHAMROCK CORP. *European Appl.* 83,554

Catalytic electrodes for use in brine electrolysis are preferably made of valve metal coated with a mixture of 22-55 mol.% Ru oxide, 0.2-22 mol.% Pd oxide and 44-77.8% Ti oxide.

Water Photodecomposition Catalyst

SIBIT S.p.A. *U.S. Patent* 4,370,263

An active catalyst for the photodecomposition of water either in the presence of or without a simplified redox system contains particles of Nb-doped TiO_2 carrying a surface layer of Ru oxide. In an example, a catalyst obtained by adding Ru chloride to a filter cake of Nb_2O_5 and TiO_2 was used in the presence of a colloidal Pt water reducing catalyst and a Ru trisbipyridyl-methylviologen redox system.

ELECTRODEPOSITION AND SURFACE COATINGS

Chemical Plating Activation

BAYER A.G. *European Appl.* 81,129

Plastics and other substrates may be activated for subsequent chemical plating by the application of a Group IB or VIII metal organic compound where the organic portion contains one group to complex the