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### Catalytic Applications

First, the work of E. L. Fromm, who used platinum group metals to catalyse absorption on hydrogen by single metals, has already been mentioned. Secondly, I. Manninger, Z. Paál and P. Tétényi, Institute of Isotopes of the Hungarian Academy of Sciences, reported the effect of hydrogen on the rate and mode of recrystallisation of platinum black as measured by X-ray methods, and the role the adsorbed-adsorbed hydrogen might have. Thirdly, the catalytic activity of palladium alloy tubes charged with hydrogen electrolytically was considered by S. E. J. Bell, T. J. McBride, S. G. McKee, J. P. Magennis and F. A. Lewis (Queen's University). Professor V. M. Gryaznov of the U.S.S.R. Academy of Sciences also reported on the catalytic activity of palladium alloy membranes in selective hydrogenation and dehydrogenation reactions, such as the conversion of acetylenic alcohol into ethylenic alcohols and conversion of butane to butadiene. As a result of the palladium shifting the equilibrium or oxygen removing extracted hydrogen the reactions may proceed to extents exceeding thermodynamic equilibrium. The hydrogenation

activity of alumina-supported palladium was shown to depend upon the previous treatment in hydrogen in the abstract of O. Leonte, M. Birjega, D. Macovei, P. Pausescu, N. Popescu-Pogriion and M. Georgescu of Romania. In addition P. Newbatt, P. A. Sermon and M. Luengo reported continuing work on the use of supported Pd<sub>2</sub> for selective catalysis of hydrocarbon reactions.

### Future Developments

Professor E. Wicke, University of Münster, F.R.G. outlined future prospects for metal-hydrogen systems and how these will be achieved with controlled expansion, rearrangement and reconstruction. To enable these hydrides to find their full potential in applications as diverse as heterogeneous catalysis, heat pumps and hydrogen purification the rate and extent of hydrogen adsorption-desorption and heat transfer must be optimised. Platinum metals are making, and will continue to make a significant contribution. This and other symposia show the international and interdisciplinary work which will allow these goals to be achieved.

The proceedings of this symposium will be published in *Zeitschrift für Physikalische Chemie Neue Folge* in the Spring of 1986.

## The Thermodynamics of Ruthenium Systems

After the publication last year of Seddon and Seddon's massive monograph "The Chemistry of Ruthenium", it might be supposed that little remains to be said on the chemistry of ruthenium (for a review of this book see *Platinum Metals Rev.*, 1984, 28, (4), 177). However, a new review paper, "The Chemistry and Thermodynamics of Ruthenium and Some of its Inorganic Compounds and Aqueous Species", by Joseph A. Rard of the Lawrence Livermore National Laboratory, succeeds in covering somewhat different ground, and contains much of value. (*Chem. Rev.*, 1985, 85, (1), 1-39).

The present paper provides a critical review of the literature, from 1910 up to mid-1984, of the inorganic chemistry of some ruthenium compounds and aqueous species with special emphasis on their thermodynamic properties.

Thus Seddon and Seddon quote thermodynamic values for RuO<sub>4</sub>, for instance, from a number of sources, while Rard provides a critically assessed table of self-consistent values.

Included in the review are ruthenium metal, hydrides, chalcogenides, oxides, hydroxides, halides, oxyhalides (except fluorides), complex sulphates, sulphites, nitrates and nitrites. Aqueous systems considered are aquo ions, hydrolysed cations, oxyanions and halide and sulphate complexes. The oxide, halide, oxyhalide and aqueous systems are described in considerable detail and an effort is made to resolve some of the conflicting claims and values in the literature. The thermodynamic properties of some intermetallic compounds are considered, together with a brief look at phase diagrams for ruthenium-metal and some ruthenium-non metal systems. J.R.T.