Hydrogen Treatment of Materials

INTERNATIONAL CONFERENCE DIRECTED TOWARDS A FUTURE HYDROGEN ECONOMY

The third international conference on "Hydrogen Treatment of Materials" (HTM-2001) was held in Donetsk-Mariupol, Ukraine, from 14th to 18th May 2001 under the chairmanship of Professor V. A. Goltsov of the Donetsk State Technical University. These conferences are aimed at the development of a worldwide hydrogen (H) economy. Many of the topics discussed related to various physical, chemical and metallurgical problems arising from H absorption and desorption, with many being concerned with H embrittlement and fracture in iron and steel. However, there were also important contributions on allied problems in nickel, aluminium, titanium, zirconium and tantalum, and other metals and alloys, in regard to alloy materials for uses, such as, permanent magnets, H storage and semiconductor technologies.

Platinum Metals-Hydrogen Systems

Studies concerned with platinum group metals-H systems reflected the depth of interest in the scientific centres of Moscow and Donetsk in palladium (Pd) and Pd alloy systems with regard to H interstitial location and H isotope diffusion. Conjoint measurements of electrode potential and relative electrical resistance over courses of changes of H content during H absorption and desorption were reported by R.-A. McNicholl and F. A. Lewis (Queen's University Belfast, U.K.) for the commercial H gas purification alloy $Pd_{77}Ag_{23}$. Evidence of the combined effects of H concentration and elastic strain gradients on estimates of H diffusion coefficients in Pd and Pd alloys was reported by V. A. Goltsov, and by E. Lunarska and O. Cherniajewa (Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw).

X-Ray crystallographic studies of non-monotonous internal structure changes in reference to synergetic model kinetic step correlations with Pd-Mo-H specimens were reported by V. M. Avdyukhina and coworkers (Lomonosov State University, Moscow). Allied studies in the Pd-Er-H system were reported by A. A. Katsnelson and colleagues; with similar studies in the Pd-Ta-H system reported by V. M. Avdyukhina and coworkers (Lomonosov State University).

Electrical resistivity measurements in Pd-H alloys during courses of H cycling were reported by A. P. Kuzin and V. A. Goltsov, while the phase states of implanted deuterium in Pd were described by V. F. Rybalko, A. N. Morozov, I. M. Neklyudov, V. G. Kulish and B. V. Borts (Physicotechnical Institute, Kharkov). Chemical potential and phase diagrams of H in Pd were reported by L. I. Smirnov and D. A. Pronchenko (Donetsk) and by N. V. Piskunov and colleagues (Russian Federal Nuclear Center – VNIIEF, Sarov, Russia). Pd lattice expansion effects due to H absorption are important to the research in Donetsk.

Related studies of changes in the dimensions of Pd plates on absorption and desorption through one preferred surface were described by V. A. Goltsov, Zh. L. Glukhova and R. V. Kotelva. Allied estimations of corresponding gradient stress developments under H diffusion were reported by T. A. Ryumshina and S. P. Il'yashenko (Donetsk).

Further video photographic observations of Pd surfaces over courses of absorption and desorption of H were shown by M. V. Goltsova, Yu. A. Artemenko, G. I. Zhirov and V. I. Zaitsev. They reported measurements over sequences of $\alpha \rightarrow \beta$ and $\beta \rightarrow \alpha$ transitions. Grain boundary processes were investigated at various temperatures and H pressures by G. I. Zhirov, Yu. A. Artemenko, M. V. Goltsova and E. A. Sidorova. Peculiarities of degassing β-phase Pd-$H_{0.61}$ at low temperatures were described by M. V. Goltsova and colleagues, while G. I. Zhirov and M. V. Goltsova reported experimental observations of a thermo-baro-elastic-diffusive equilibrium in transforming α- and β-phase in the Pd-H system.

The *International Journal of Hydrogen Energy* plans to publish selected papers.

F. A. LEWIS

Fred Lewis is now retired from Queen's University Belfast. He is still actively interested in the effects of hydrogen in metals, particularly those of palladium and palladium alloys.