CATALYTIC PECULIARITIES OF ULTRA-THIN PALLADIUM FILMS AND ITS ALLOYS

V. G. Litovchenko, T. I. Gorbanyuk, O. O. Yefremov, A. A. Yevtukh, Yu. G. Ptushinskyy[1], *V. A. Ischuk*[1], *O. V. Kanash*[1]

Institute of Semiconductor Physics,
Nat. Acad. Sci. of Ukraine
(45, Nauky Prosp., Kyiv 03028, Ukraine),
[1]Institute of Physics, Nat. Acad. Sci. of Ukraine
(46, Nauky Prosp., Kyiv 03028, Ukraine)

S u m m a r y

The results of experimental studies of hydrogen adsorption (sorption) on the surface of thin (300 – 500 Å) and ultra-thin (1 – 4 monolayers) palladium films and palladium – copper composite are presented. The films were deposited on both a layered dielectric-semiconductor (DS) structure and on single-crystalline tungsten substrates, respectively. In the first case, the experiments for metal– dielectric – semiconductor (MDS) structures (M = Pd or Cu/Pd) have been carried out in hydrogen– argon gas mixtures with hydrogen concentration ~ 500 ppm. For Pd/W(110), Cu/Pd/W(110), O_2/Cu/Pd/W(110) structures, the measurements under ultra-high vacuum conditions (~ 1×10^{-9} Torr) have been performed. It was shown that ultra-thin copper layers deposited on the Pd surface promote the dissociative adsorption, suppress the desorption of hydrogen, and contribute to the transfer of atomic hydrogen into the bulk of the film. As a result, the sensitivity of MDS structures with Cu/Pd electrode to hydrogen adsorption increases. Mechanisms of the enhanced dissociation of hydrogen and hydrogen-containing compounds at the surface of $PdCu_x$ alloy are discussed.