

BEHAVIOR OF HYDROGEN  
DURING CRYSTALLIZATION OF THIN  
SILICON FILMS DOPED WITH TIN

*R.M. Rudenko*<sup>1</sup>, *M.M. Kras'ko*<sup>2</sup>, *V.V. Voitovych*<sup>2</sup>,  
*A.G. Kolosyuk*<sup>2</sup>, *V.Yu. Povarchuk*<sup>2</sup>, *A.M. Kraichynskiy*<sup>2</sup>,  
*V.O. Yukhymchuck*<sup>3</sup>, *V.Ya. Bratus'*<sup>3</sup>,  
*M.V. Voitovych*<sup>3</sup>, *I.A. Zaloilo*<sup>4</sup>

<sup>1</sup>Taras Shevchenko National University of Kyiv,  
Faculty of Physics  
(2, *Prosp. Academician Glushkov, Kyiv 03680, Ukraine*;  
*e-mail: rudenko.romann@gmail.com*),

<sup>2</sup>Institute of Physics, Nat. Acad. of Sci. of Ukraine  
(46, *Prosp. Nauky, Kyiv 03028, Ukraine*),

<sup>3</sup>V.E. Lashkaryov Institute of Semiconductor Physics,  
Nat. Acad. of Sci. of Ukraine  
(45, *Prosp. Nauky, Kyiv 03650, Ukraine*),

<sup>4</sup>National University of Life and Environmental  
Sciences of Ukraine  
(15, *Heroiv Oborony Str., Kyiv 03041, Ukraine*)

S u m m a r y

The behavior of a hydrogen impurity in the course of crystallization of thin silicon films doped with tin (a-SiSn films) has been studied. It is found that the band located at about 2000–2200 cm<sup>-1</sup> and corresponding to the IR absorption at silicon–hydrogen bonds is absent from the spectra of as-deposited (at a temperature of 300 °C) a-SiSn films with Sn contents within the interval of 1–10 at.%. In undoped thin silicon films (a-Si films), the hydrogen content diminishes below the sensitivity threshold of the measurement technique only after the annealing of the specimens at 700 °C. The absence of hydrogen in a-SiSn films is in good agreement with the results of EPR studies and the results of Raman scattering studies of structural transformations in thermally treated films. It is shown that the formation of crystalline phases in a-SiSn occurs at lower temperatures as compared to those in a-Si, with a correlation taking place between the crystallization temperature for Si clusters and the concentration of the tin impurity. Taking into account that tin reduces the temperature of the hydrogen effusion from the film volume and, accordingly, stimulates the ordering in the specimen structure, it is possible to consider that hydrogen impurity takes part in the processes that result in a decrease of the crystallization temperature for a-SiSn.