Comments

on the thesis entitled "*Acoustically and radiation induced phenomena in surface barrier silicon and gallium arsenide structures*" by Dr. O.Ya. Olikh for the degree of Doctor of Science in Physics and Mathematics on specialty 01.04.07 - Solid State Physics.

Influence of ultrasound waves on semiconductor materials and devices is the field, which is not studied well. Many new effects, possibility of tuning materials or device properties remained unknown. In the present dissertation study of this problem has been one of the main focuses. The acoustically stimulated dynamic effects have been studied in Si-based devices and Schottky contacts and the physical mechanisms of irradiation and ultrasonic loading on the current transport in semiconductor surface-barrier structures have been clarified. So, the dissertation addresses an important study that present interest from scientific and applications points of view. As a result of the systematic research work, the author has received several new and exciting results. Especially, I would mention (i) the model of acousto-active complex of point defect that act as the recombination center with tunable distance between components during ultrasound treatment; (ii) Discovery of the effect of reversible increase of the electrical current during ultrasound treatment at 305 K related to interaction of acoustic waves with linear defects in non-irradiated materials and with point radiation defects in irradiated samples; (iii) Discovery of the effect of dynamic acousto-induced tuning the Schottky barrier height that will influence on electrical properties of device structure; (iv) observation of influence of acoustic waves on defects in the near surface area of GaAs and SiC. I should mention here that the outcomes of the dissertation are more than the above list.

Methods used in the thesis are highly appropriate to the work performed. The results obtained in the dissertation have been documented in 25 journal articles. Among them 10 articles are in International journals of high impact factor. The results have been disseminated in 29 Conference presentations.

I have the following comment:

1. Although the influence of ultrasound on defects is reflected in tuning of materials properties, it is not clear the microscopic mechanism of interaction of ultrasound waves with point defects as the ultrasound wavelength is larger than the point defect size;

I should mention that I do not know Ukrainian language, but I am following all scientific papers published by Dr. Oleg Olikh. Some time ago my PhD student was working on influence of ultrasound waves on light emitting diodes in dislocation engineered Si. About two years ago, in our industrial project we have used ultrasound treatment on Si wafers for solar cell applications. So I know well the key points in the research by Dr. Oleg Olikh.

In summary, my opinion about the dissertation is positive. Systematic work has been performed on very high level. The dissertation fits well to the level corresponding to the degree Doctor of Science in Physics and Mathematics. I strongly recommend nomination of Dr. Oleg Olikh to the degree.

Smagul Karazhanov

Doctor of Science in Physics and Mathematics, specialty 01.04.10 - Physics of semiconductors and dielectrics
Senior Researcher
Solar Energy Department, Institute for Energy Technology (IFE), P.O Box 40, 2027 Kjeller, Norway
E-mail: smagul.karazhanov@ife.no
Mobile: (+47) 9651 7797 Fax: (+47) 6389 9964