

Project 4.28. Oxide materials implanted with rare earths

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Unit: ON4.2

Webpage of group: <http://www.ifpan.edu.pl/sdvs/pl/on4.2.html>

Background:

Wide band gap semiconductors such as ZnO or GaN (E_g around 3.4 eV at room temperature) implanted with rare earth elements are promising materials for applications in optoelectronics. Ion implantation is a convenient technique for introducing rare earth elements into the semiconductor matrix because dopant concentration and its depth profile can be easily controlled. However, the ballistic nature of the implantation process leads to destruction of the crystal lattice, so post-implantation annealing is necessary for lattice recovery and optical activation of the dopants. Recent studies indicate that such annealing leads to the transformation of defects and the formation of defective complexes that have a significant impact on optical properties of implanted material.

Aim:

The aim of the project is to study the optical and electrical properties of oxide materials such as ZnO or ZnMgO implanted with rare earth elements directed to applications in optoelectronics. In particular, research will focus on identifying of defect complexes arising during implantation and subsequent annealing. Epitaxial oxide layers of ZnO and ZnMgO will be grown by Atomic Layer Deposition (ALD) technology. Implanted semiconductor layers will be characterized optically and electrically at IF PAN. Identification of defect complexes will be carried out using synchrotron radiation methods (photoemission and absorption techniques).

Requirements:

MSc in physics or related field. The ability to program in LabView will be appreciated.