Project 6.2. Point defects in gallium nitride crystals grown ammonothermaly and from vapor phase

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www: www.unipress.waw.pl/growth

Background:

The goal of this project is to perform an extensive study of point defects in high structural quality bulk gallium nitride (GaN) crystals obtained by ammonothermal and halide vapor phase epitaxy (HVPE) methods. Both, unintentionally and intentionally doped (by donors and acceptors) crystals will be studied. A complex examination of point defects in bulk GaN crystals will be performed. This will be carried out by many characterization techniques: temperature dependent Hall effect measurements, High-Resolution Photoinduced Transient Spectroscopy, Deep Level Transient Spectroscopy, Fourier Transform Infrared Spectroscopy, photoluminescence and Contactless Electroreflectance Spectroscopy. The concentration of dopants will be measured by Secondary Ion Mass Spectrometry. Native point defects will be identified and their concentrations in the crystals will be estimated. The influence of the point defects on electrical and optical properties, as well as compensation mechanisms, will be studied. All the experimental results will be described by calculations based on solutions of charge neutrality equation. The project will provide many valuable information about the favored conditions of point defect formation, verification of energy level positions known from ab initio calculations, and the interaction with impurities (dopants).

Aim:

The aim of the project is a systematic study on identification and quantitative analysis of point defects in bulk gallium nitride (GaN) crystals obtained by ammonothermal and halide vapor phase epitaxy methods. Point defects in bulk GaN, their formation enthalpy, energy levels and interaction with impurities (dopants) will be investigated. The complex research will be based on a variety of complementary experimental techniques.

Requirements:

- completed higher education (MA) in the field of: physics, chemistry, materials engineering, electronics or derivatives
- knowledge of the English language
- basic knowledge of nitride semiconductors and methods of their crystallization as well as wafering procedures (substrates' preparation from as grown crystals)