DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

State the objective of the project, describe the basic research to be carried out, and present reasons for choosing the research topic - max. 2 standard type-written pages

Semiconductor nanowires (NWs) attracted much attention in last years as promising building blocks for construction of modern microelectronic devices. The main reason is that very high quality monocrystalline materials can be obtained in a form of NWs, even if they are grown on lattice mismatched or amorphous substrates. Moreover, a surface to volume ratio in NWs is very large, which makes them ideally suitable for sensor or light emitter applications.

The project is focused on fabrication and testing of new optoelectronic devices and sensors made of nanowires (NWs) of nitride semiconductors. This will require initial basic studies of mechanisms of catalyst-free nucleation and plasma-assisted MBE (PAMBE) growth of nitride nanowires (NWs). Right now this is one of the mostly studied group of materials for microelectronics, which is due to their unique electronic and optical properties as well as high chemical resistance. By using quadrupole mass spectroscopy (QMS) and reflection high energy electron diffraction (RHEED) growth kinetics of NWs will be analyzed on various substrates allowing determination of main growth parameters and properties of NWs as a function of microstructure of substrate on which NWs grow. At all stages of the project nanowires produced will be analyzed by XRD, SEM, TEM and by optical techniques to clarify influence of the substrate and growth conditions on their structural and optical properties.

The main goal of the project is to implement results of our basic studies by developing new concepts of nanowire structures for modern optoelectronics. This will help to improve considerably properties of devices, including their sensitivity, power, efficiency and extension of the spectral range. Finally, research proposed will contribute to our basic knowledge on physics of heterogeneous nucleation processes. In particular, influence of substrate defect structure on nucleation kinetics is the new, original contribution. Such effect is not well studied and understood, especially for the materials to be studied.