Title: Epitaxy of InGaN superlattices on relaxed, porous GaN substrates

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Institute: Institute of High Pressure Physics PAS

Unit: NL-14

WWW of the unit: https://www.unipress.waw.pl/mbe/en

Background:
The project focuses on developing a new generation of red electroluminescent microdiodes (microLEDs) based on Group III nitrides, capable of emitting light at wavelengths above 570 nm while maintaining high efficiency and wavelength stability. The key innovation is the use of InGaN/InGaN superlattices as the active region, deposited by plasma-assisted molecular beam epitaxy (PA-MBE) on specially designed porous GaN pseudostrates. This solution will reduce the stresses resulting from the large difference in lattice constants between GaN and InN, increase the indium content, and improve the structural quality of the material. As part of the project, numerical simulations will be conducted, porous pseudo-substrates will be developed and optimized, LED and microLED structures with various superlattice configurations will be fabricated, and their comprehensive structural, optical, and electrical characterization will be performed. The expected result will be the demonstration of high-efficiency red microLEDs with stable emission, which can be used in next-generation displays (AR/VR), optogenetics, phototherapy, sensors, and optical communication systems. The project will also make a significant contribution to the advancement of knowledge regarding stress engineering and quantum structures in nitride materials.

Aim of the project:
The goal of the project is to develop a new generation of red microLEDs based on InGaN/InGaN superlattices grown on porous GaN pseudostrates, capable of emitting light at wavelengths above 570 nm with high efficiency and wavelength stability. Achieving this goal will help overcome the current limitations of nitride light-emitting technologies and lay the foundation for modern optoelectronic applications.

Requirements:
- MSc in physics or similar specialization (semiconductor physics/solid state physics preferred),
- experience in the electrical characterization of nitride LED structures and good knowledge of simulation programs (Silence, Nextnano) are welcome.
- eagerness to acquire new knowledge,
- ability to solve various technical challenges
- very good English.