

Project 6.3 Epitaxy and properties of nitride based optoelectronic devices InAlGaN/NbN

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www: <http://www.unipress.waw.pl/mbe/en>

Background:

Integration superconducting (NbN) with semiconducting (InAlGaN) layers within one nitride semiconducting system is very interesting extension of application of nitrides in electronic and optoelectronics. Especially attractive is possibility to growth of vertical Josephson junctions NbN/InAlGaN/NbN where control of the interfaces is on atomic scale during epitaxial growth in plasma assisted molecular epitaxy system. Integrated circuits making use of the Josephson junctions are one of potential solutions for future quantum computers. Properties of monolithic nitride based Josephson junctions can be different from investigated hybrid junctions NbN/metal, where the Schottky barrier can be present on interface (due to exposure of interface to the air during technological process).

Aim:

The aim of this project is understanding of the growth mechanism of NbN on GaN and AlN substrates by plasma assisted molecular beam epitaxy (PAMBE). The nitride structures will be grown at our MBE laboratory. Thin NbN superconducting layers will be used in design and investigation of:

- (a) Single photon detectors
- (b) Vertical Josephson junctions
- (c) Nitride based light emitting diodes driven by Cooper pairs.

Requirements:

- The candidate must have completed higher education (MA) in the field of: physics, materials science and engineering, electronics or similar or provide the date of the planned defense (before 01/10/2021);
- knowledge of the English language;
- motivation and willingness to work, good organization skills and self-discipline;
- knowledge of the properties of nitride materials and work experience in clean-room laboratory will be an asset.