Impact of MBE growth parameters on antimonide material properties: results review and technological challenges at VIGO Photonics

Łukasz Kubiszyn [1], **Bartłomiej Seredyński** [1], **Dariusz Smoczyński** [1], **Krystian Michalczewski** [1]
[1] *VIGO Photonics S.A., ul. Poznańska 129/133, Ożarów Mazowiecki, Poland*

Over the past decade, VIGO Photonics has been advancing the technology of antimonide materials epitaxially grown on GaAs substrates, particularly InAs/InAsSb superlattices. The antimonide heterostructures we develop form the foundation for infrared photodetectors, with performance levels nearing those of VIGO's state-of-the-art mercury-cadmium telluride devices. To validate and optimize the Molecular Beam Epitaxy (MBE) growth process parameters, we utilize a range of characterization techniques for both the material investigation and prototype device evaluation. *In-situ* vacuum methods such as Reflection High-Energy Electron Diffraction and Magnification Inferred Curvature monitoring allow us to evaluate crystal quality, lattice matching, and strain during the growth. Complementary *ex-situ* techniques, such as high-resolution X-ray diffraction supported by simulation software, enable precise determination of SL period and composition.
The presentation will highlight technological aspects of the MBE system, addressing challenges such as system maintenance, ultra-high vacuum obtaining, process reproducibility, and the distribution of selected parameters, including superlattice composition, period and lattice mismatch across 3" wafers.