Task of the Master's thesis in the NanoEngineering program

Topic: Abrupt nanowire pn heterojunctions for

detector applications

Task:

In the BHE department, GaAs-based nanowires are produced using metal-organic vapor phase epitaxy in the vapor-liquid-solid epitaxy process. The wires are intended to be used to create pn-doping junctions in heterostructures. The aim of the work is to simultaneously provide axial hetero- and pn-junctions at one point with the sharpest possible junctions.

The master's thesis consists of the following components. In the first step, possible heterojunctions in the III-As/III-P system are to be tested for their suitability in the vapor-liquid-solid epitaxy process with Au source point. The GaAs-GaP system is considered as a starting point. In the next step, a suitable dopant is to be defined for the material selection made. Dopant sources for C, Zn, Sn and Si are available in the system.

For the selected combinations, a physical simulation of the minority transport must be carried out, taking into account finite transition sharpness for doping and heterojunctions. The promising structures are then implemented experimentally using metal-organic vapor phase epitaxy. The candidate is supported by members of the department during the growth of the structures. Finally, the nanowire pn structures must be electrically and photoelectrically characterized and tested for their suitability as fast, spatially high-resolution detectors.