

Understanding doping of semiconducting nanowires

Semiconductor nanowires (NWs) is an extremely active research area in the nanoscience community. Integration of semiconducting NWs with the well-established capabilities and low production cost of silicon is crucial for the implementation of novel quantum emitters, such as single photon sources on Si. Development of this area requires control of the nanowire structure with atomic precision, and this in turn is reliant on the ability to map the structure and composition with atomic resolution. New techniques, such as differential phase contrast imaging can be used to characterise the local electric field distribution, i.e. to visualise the built-in electric field formed at p-n junctions in semiconducting nanowires.

This project will involve the development of electron microscopy techniques based on the phase shift of the electron wave to analyse the doping in semiconducting nanowires. The successful applicant will be trained in the use of the doubly aberration corrected TEM/STEM at Warwick, which has the capability for sub-Å resolution imaging and spectroscopy. There are significant challenges to get a precise measure and characterization of different dopant concentration, as well as the visualization of the electrostatic potential and associated electric field in these nanowires. A successful and robust understanding of the doping mechanisms will provide better control optical properties of the nanowires.

The PhD position corresponds to 3.5 years of research studies on advanced electron microscopy. The candidate will also have the opportunity to develop skills in operating advanced aberration corrected-TEM/STEM and spectroscopy with sub-Å resolution, sought-after skills in the current technology market. The successful applicant should have a good degree in Physics, or related subjects, good background knowledge of semiconductor Physics is preferred.