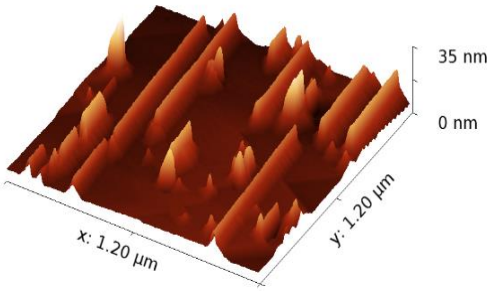
Karlsruher Institut für Technologie

Laboratory for Applications of Synchrotron Radiation (LAS), and

Institute for Photon Science and Synchrotron Radiation (IPS)

Master Thesis at the Institute for Photon Science and Synchrotron Radiation (IPS)

Growth and characterization of $FeSi_2$ nanowires



The NANODYNAMICS team at the Institute for Photon Science and Synchrotron Radiation (IPS) offers an insight into the intriguing world of nanophysics. We investigate the behaviour of lattice vibrations (phonons) in crystals with sizes in the nanometre range and the influence of dimensionality, size, structure and strain on the thermodynamic properties of these systems.

Motivation:

The continuous miniaturization of electronics raises fundamental questions about the behaviour of phonons in nanostructures and their coupling to other particles, e.g. electrons. Due to their one-dimensional nature, in nanowires strong deviations from the vibrational behaviour of bulk materials are expected. Up to now, the measurement of the phonon density of states in nanowires is one of the grand challenges in surface science. In the technologically import material class of silicides, the $FeSi_2$ is probably the most interesting example. It exhibits the unique property to be available in different metallic phases and also in a semiconducting phase (β-Phase). Measuring the phonon density of states in semiconducting nanowires would be a novelty in the field of solid state physics.

Thesis description:

Aim of this master thesis is the growth of $FeSi_2$ nanowires in the semiconducting β-phase together with reaching a fundamental understanding of the phase transitions in $FeSi_2$ nanowires. In order to achieve this, you will be introduced to the growth of nanostructures via molecular beam epitaxy to be able to produce samples on your own and to systematically investigate their structural properties. Depending on its progress, the thesis could be completed by measuring the phonon density of states of the grown $FeSi_2$ nanowires at the Deutsches Elektronen-Synchrotron (DESY, Hamburg).

Topics:

- Surface Science / Nanostructures
- Molecular Beam Epitaxy
- Ultrahigh Vacuum Technology
- Synchrotron Radiation

Start after consultation

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