

IMTEK – Laboratory for Nanotechnology
Prof. Dr. M. Zacharias

Offered Position: Master thesis

Fundamental electronic properties of silicon nanocrystals and their applications

The group of Nanotechnology at the Department of Microsystems Engineering (IMTEK), Albert-Ludwigs University Freiburg (Germany), is offering an immediate opening for a Master thesis. The plan is to continue the work later in a PhD thesis. The project is focused on the study of the fundamental electronic properties of silicon nanocrystals (Si NCs). Because of quantum confinement effect, the Si NCs exhibit physical (optical, electrical) properties, which can be modulated by controlling the NC size and which strongly deviate from bulk Si. The NT Group is internationally well known for the work on size-controlled Si NCs embedded in dielectric matrices such as SiO₂.

The student will fabricate the Si NCs by PECVD processes, as well as employ them as active layers in light-emitting device structures. The candidate will optimize the electro-optical response of Si NC-based devices by studying both new material approaches (such as co-doped (P, B) Si NCs) and device designs (improvement of electron and hole injection). We offer not only the most adequate tools for optimum material preparation and characterization, but also an environment of highly-experienced researchers and long-term international collaborations, by means of which a better understanding of the Physics governing Si NCs-related phenomena will be achieved.

The Laboratory of Nanotechnology is well established and offers top level research activities in fields like nanolithography, nanowires and nanocrystals; for more information see: <http://www.imtek.de/professuren/nano>.

Candidates should have a strong background in Physics, Solid-State Physics or Material Science. Experience regarding clean room techniques, thin film deposition (CVD, ALD), materials characterization (TEM, SEM, optical, electrical), and skills in understanding carrier transport behaviour in optoelectronic devices would be of advantage.

Applications should include a CV, certificates corresponding to previous studies, and the names of two referees, which must be addressed to:

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