



# Seminarankündigung

**Dienstag, 18. Februar 2014  
15:00 Uhr**

**ZNN, Seminarraum EG 0.001**

## **“Nanowire photonics – an assessment by multi-physics simulation”**

Semiconductor nanowires possess cross-sections from 2-200 nm and lengths of several micrometers. Due to their high aspect ratio, they combine nanoscopic features and, at the same time, build an interface to the macroscopic world, which makes them an exciting building block for future electronics and photonics. Both principles of nano-optics as well as nano-electronics can be applied at the same time. Despite tremendous progress in the processing technology, the exploitation of the full potential for optoelectronics is still on the horizon. Detailed theoretical modeling has the ability to both clarify the fundamental operation principles, as well as to assess the ultimate performance by optimum designs.

In this presentation, the physical principles of semiconductor nanowire arrays are discussed, with a focus on applications for solid state lighting and photovoltaics. As analysis tools, specific physics-based numerical models for nanophotonics and nanoelectronics have been developed, which will be discussed. For the case of solid state lighting, the electro-optical efficiency of Gallium-Nitride based nanowire light emitting diodes (LED) is studied, and compared to conventional thin-film LED technology. For photovoltaics, a detailed 3-dimensional electromagnetic analysis of a nanowire semiconductor solar cell is presented, from which fundamental rules in terms of materials choice and wire geometry will be derived. As main results, we can outline a roadmap for nanowires in future 3rd generation photovoltaics and unveil the critical issues for nanowire solid-state lighting.

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