Nanotechnology, a scientific and technological discipline that takes advantage of new properties on the nanoscale, offers great promises for future applications. It explores unique properties of materials when their dimensions are comparable to the relevant correlation lengths, and requires innovative synthesis and fabrication methods.

We use rational synthesis of free-standing nanoscale objects like nanowires, nanocrystals, and nanotubes and combine spectroscopic techniques, transport measurements and advanced electron microscopy techniques to directly correlate structural and physical properties on the nanometer scale. Our interdisciplinary approach combines the following sub-programs:

- Growth of semiconductor nanowires and nanowire heterostructures with new structural, optical, magnetic, and electric properties.
- Development of new experimental tools for synthesis and nanoscale characterization of nanostructured materials.
- Applications in nanophotonics, nanoelectronics, and energy.

Experimental techniques and methodologies that are being developed as a part of our research endeavor are generally applicable to any material system where interplay between nanostructure, properties, and performance becomes significant.

### Group Members

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  - 3rd-Year Graduate Student
  - Research Interests: Nanotechnology for renewable energy
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- **Silvija Gradečak**
  - Thomas Lord Assistant Professor of Materials Science and Engineering
  - Ph.D. - Swiss Federal Institute of Technology (Lausanne)
  - Courses: 3.074J/3.44 - Imaging of Materials
  - 3.072 - Fundamentals of Materials Science

### Synthesis of Nanostructured Materials

#### Chemical vapor deposition (CVD) based growth of nanowires: via the supercritical fluid (SCF) growth mechanism, which can be utilized to form homogeneous nanowires as well as axial and radial heterostructures.

#### Advanced Characterization Techniques

- **Lattice mismatch heterostructured electronic micrograph** and electron diffraction pattern of GaN/AlN nanowire heterostructure (a). Atomically abrupt interface between AlGaN and GaN (b). A schematic of cathodoluminescence (CL) integrated with TEM (c).

#### Applicaitons

- **Hybrid photovoltaics**

- **Nanowire Light Emitting Diodes**

#### Recent Publications