CNM WK#1: Nanomaterials Interfaces: from Fundamentals to Applications

Organizers: Elena Rozhkova and Richard Schaller

The directed evolution of the properties of a new material, either at the level of a single nanostructure or integrated into a hybrid or device, is inevitably associated with the formation of interfaces. As an integral part of virtually any material design, interface development covers a wide range of fundamental research and applied areas, blending approaches from physics, chemistry, materials, and life sciences. Thus, the properties of the interface determine the transfer of energy, charge, and spin through nanostructured materials. The fabrication of batteries and fuel cells involves the detailed interfacing of several materials at the electrodes to achieve high performance. Semiconductor-semiconductor or semiconductor-metal interfaces also prescribe charge transfer processes for photovoltaic or photocatalytic response. Further, the nanomaterial - biological entity interface requires educated approaches to combine them into functional hybrids and optimize surface properties for biolectronic, sensors and biomedical applications.

The nanomaterial interfaces engineering requires advanced characterization tools, synthetic and fabrication approaches, and computational methods. The purpose of this workshop is to present major trends in interface research and discuss the tools, expertise, and approaches that the Center for Nanoscale Materials can bring to the wider scientific community.

This workshop will cover but not be limited to the following areas:

- Modeling of interfaces toward applications
- Fundamental aspects of nanomaterial interfaces
- Synthesis of novel nanomaterials with optimized interfaces (e.g., defects, doping, band gap engineering etc.)
- Characterization of nanomaterial interfaces
- Interfaces in nanomaterial-design for application in (electro/photo) catalysts, batteries, fuel/solar cells, (opto)electronic devices, (bio)sensors, and biomaterials.