Physical Sciences Seminar

Tailor-Made Chalcogenide Colloids: Tuning Size, Composition, and Structure of Nanomaterials

Maksym Yarema
ETH Zürich

Host: Maria Ibanez

Chalcogenide semiconductors comprise an important class of materials with a plethora of uses in photovoltaic, thermoelectric, catalytic, phase-change memory and other applications. Likewise, colloidal chalcogenide nanocrystals retain the first place as material sets for fundamental and use-inspired research. In this talk, I will summarize our recent work, regarding colloidal selenide and telluride nanomaterials. Traditionally, the properties and performance of nanocrystals are tuned by accurate control over their size, stemming from quantum confinement phenomena. Multicomponent nanocrystals provide an extra tuning knob: composition-dependent effects are superimposed on size dependences. Synthesis of multicomponent nanocrystals, however, remains a synthetic challenge, due to side reactions and difference in reactivity of starting precursors. Taking examples of ternary and quaternary chalcogenide nanocrystals (Ag-In-Se, Cu-Zn-In-Se, etc.), I will highlight an amide-promoted synthetic approach that enables independent control over nanocrystal size and composition. This allows us to separate the composition and size effects as well as detect optimal ternary and quaternary compositions, which exhibit enhanced luminescence efficiencies. Structure of colloidal nanocrystals provides yet another way of tuning their properties and performance. In this part of the talk, I will focus on GeTe nanoparticles,particularly on reliable size-controlled synthesis of colloidal phase change materials and determination and understanding of size-dependent crystallization temperature. Finally, we will discuss the influence of size-dependent phase transitions on phase-change properties, which stems from physical nanodimensions of GeTe colloids.

Thursday, February 6, 2020 11:00am - 01:00pm
Heinzel Seminar Room / Office Bldg West (I21.EG.101)

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.