Graduate School Event

Thesis Defense: Nanoparticle-Based Precursors toward Advanced Crystalline Inorganic Solids

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Well-defined powder precursors are important for the rational design of crystalline inorganic solids with controlled microstructures and functional properties. Such powders can be prepared by nanoparticles through surfactant-assisted synthesis (or colloidal synthesis) that provides precise control over size, shape, composition, and surface chemistry of nanoparticles. These tailored nanoparticles further act as building blocks for 3D assemblies, exhibiting collective nanoscale properties and enabling tailored microstructures in inorganic solids. However, the programmable design of crystalline inorganic solids from nanoparticle-based precursors remains limited, due to a lack of fundamental understanding of both the synthesis of nanoparticles and their conversion into macroscopic solids. Furthermore, creating three-dimensional nanoparticle assemblies often requires multi-step post-synthetic treatments, which can limit their scalability and reproducibility.In this thesis, I demonstrate key synthetic parameters governing the formation of desired nanostructures, especially metal/semiconductor core/shell nanoparticles which are potential precursors for engineering composition, crystal structure, and defects of final solids. Then, I investigate their transformative pathways to unveil atomic-scale structural and chemical changes that can occur during heat treatment of the NP-based precursors. Building on this insight, I further demonstrate the possibility of a rapid and scalable nanoparticle assembly in the synthesis by avoiding complex post-synthetic steps. Finally, I investigate how nanoparticle-based precursors influence the formation and resulting properties of crystalline inorganic solids, highlighting the potential of employing NP-based precursors for the rational design of bulk inorganic solids.

Friday, August 22, 2025 09:30am - 10:30am

Sunstone Bldg / Ground floor / Big Seminar Room B (I23.EG.102) and Zoom

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.