

EINLADUNG zum IFP-SEMINAR

Bottom-up Engineering of Thermoelectric Materials

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Host: Silke Bühler-Paschen
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Ort: Institut für Festkörperphysik, TU Wien
Wiedner Hauptstraße 8-10, 1040 Wien
Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

Nanocrystals can be envisioned as artificial atoms to build-up materials from. Colloidal synthetic routes are capable to yield nanocrystals with precise control of size, shape, crystalline phase and composition, thus allowing to accurately engineer such artificial atoms. Therefore, a new generation of complex materials with nanoscale control can be created in which components and functionalities can be defined in a predictable manner. Beyond nanocrystal design, another key player on the building-up process is the nanocrystal surface. Most synthetic strategies developed render nanocrystals with organic molecules coordinated at their surfaces (ligands). By locally controlling surface energy and charge is possible to exchange native ligands by other organic or inorganic molecules that may incorporate foreign atom/ions at each surface site. The possibility to modify nanocrystal surface chemistry opens a new degree of freedom to tune final nanomaterial properties, defining the surface ligand as a building block on its own. Last but not least, the functional properties are as well determined by the nanocrystals organization, interconnection, packing density and relative crystal orientation in the final nanomaterial. Herein, we present three different strategies that allow to optimize transport properties at different material production level (TOC Graphic): i) nanoparticle synthesis; ii) nanoparticle surface tuning; and iii) nanoparticle consolidation. These results demonstrate the unique possibilities of the nanocrystal bottom-assembly to produce high performance thermoelectric nanocomposites.

