Lehrstuhl für Physik

Department Physik, Mechanik und Elektrotechnik
Montanuniversität Leoben

A-8700 LEOBEN, Franz Josef Straße 18, Austria
Tel: +43 3842 402-4601
e-mail: physics@unileoben.ac.at

S E M I N A R
on
Semiconductor Physics and Nanotechnology

Mo, 10.11.2025, 11:15 Uhr,

Seminar in
person in the Physics lecture hall *or* via Zoom

"Investigations of Colloidal Nanocrystals using X-ray Scattering Techniques with Lab and Synchrotron Sources"

Dr. Rainer T. Lechner

Chair of Physics, Department Physics, Mechanics and Electrical Engineering, Technical University of Leoben, Austria

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Chemical synthesised colloidal nanocrystals (NCs) offer the opportunity for realising novel materials with tailored functionalities. The relevance of this research topic for the society was illustrated by awarding the Nobel Prize for Chemistry to three top researchers in this field 2023.

In this presentation, I will give examples how we can reveal the inner structure, size and shape of these NCs with various x-ray scattering techniques (SAXS, WAXS, XRD, etc.) at lab and at large scale research facilities, like the synchrotrons: ESRF, ELETTRA and DESY-PETRA III.

Especially an inner core/shell structure of semiconducting NCs leads to an increased photoluminescence (PL) output. But also, the NCs' shape determines their optical performance. We have revealed a relation between structure and functionality by combining different scattering techniques with microscopy techniques. An extension to standard SAXS is anomalous SAXS (ASXAXS), where by variation of the x-ray energy close to an absorption edge chemical information of NCs can be obtained. I will not only show *ex-situ* ASAXS/WAXS studies on already synthesised core/shell NCs, but also very recent results, where we follow *in-situ* the growth process of elongated, rod-like NCs.

The NC's shape can also significantly influence the super-crystal structure of colloidal supercrystals SCs, where NCs act as building blocks to form 3D nanocrystal solids of *micrometer size* and with designed properties. With *in-situ* SAXS studies we can follow the SC growth process in real time.

Furthermore, from SAXS data the 3D mean shape of NCs can be retrieved using advanced, model-free techniques. This allows to follow a very strong transformation in shape during growth of iron oxide NCs. The FeO NCs transform from nanostars to nearly perfect nanocubes, but with rounded corners. The congruence of the results is demonstrated by comparison to local sensitive, but only 2D TEM analysis.

Zoom – Link:
https://zoom.us/j/96375934537?pwd=RTlKTWhSdzRHU211YTY1bGFxTUtpZz09
Meeting-ID: 963 7593 4537
Kenncode: =r=4YQ