WIEDNER HAUPTSTRASSE 8-10
A-1040 WIEN, AUSTRIA
TEL.: ++43-1-58801-13801
FAX: ++43-1-58801-13899
E-MAIL: SEKRETARIAT@IFP.TUWIEN.AC.AT

TECHNISCHE UNIVERSITÄT WIEN
VIENNA UNIVERSITY OF TECHNOLOGY

Einladung zum Vortrag

Jürgen Roither

Institute of Semiconductor and Solid State Physics
Johannes Kepler University, Linz

" Embedded colloidal nanocrystals in inorganic multilayers – a route towards novel device functionalities "

Colloidal nanocrystals are solution-grown, nanometer-sized, inorganic particles exhibiting tunable physical properties that are easily controlled by their composition, size and shape. Due to their unique solution processability, several applications of colloidal nanocrystals have been demonstrated e. g. by combining them with organic semiconductors (conjugated polymers) [1]. Their monolithic integration in inorganic materials, however, has so far been a bottleneck in respect to their combination with conventional inorganic electronic and optical devices. Efforts previously performed with molecular beam epitaxy, for instance, resulted in degraded physical properties of the nanocrystals due to the required substrate temperatures for epitaxial growth close to their melting point [2].
For this reason, the controlled embedding of numerous kinds of nanocrystals into dielectric and semiconductor materials is explored in the present work. In particular, the nanocrystal films, deposited on various substrates, e. g. by spin-coating, are overgrown by dielectric layers, fabricated by ion-beam assisted electron beam deposition. Here the controlled ion-beam assistance allows to obtain high quality dielectric coatings with smooth surfaces on top of the nanocrystals, even when they are deposited at room temperature. Moreover, the specific physical properties of the nanocrystals, such as their high photoluminescence efficiencies or their plasmonic properties are completely sustained after embedding, as is experimentally confirmed at ambient conditions. The combination of colloidal nanocrystals with dielectric layers opens the pathway towards novel device structures. In this respect, optical waveguides as well as microcavity light emitting devices based on luminescent semiconductor nanocrystals are presented. Furthermore, the subsequent integration of semiconductor, noble metal and magnetic nanocrystal films in dielectric coatings is demonstrated to result in novel multifunctional nanocrystal composites with great potential for future applications. Finally, noble metal and semiconductor nanocrystal films, spatially separated with nanometer-precision, are combined to investigate interactions between surface plasmons and electronic states, and to demonstrate plasmon enhanced nanocrystal luminescence.

[1] Yadong Yin and A. Paul Alivisatos, Nature 437, 664 (2005) and refs. therein
[2] U. Woggon et al., Nano Letters 5, 483 (2005)

Host: S. Bühler-Paschen

Montag, 14. September 2009, 11:00 Uhr
Seminarraum 138B, 7. OG, Turm C (rot)
Wiedner Hauptstraße 8-10
1040 Wien