

# PHYSIKALISCHES KOLLOQUIUM

Mittwoch, 06.11.2013, um 17:15 Uhr

Ort: Reichenhainer Str. 90; Neues Hörsaalgebäude, Raum: 2/N013



**Prof. Dr. rer. nat.  
Johannes Heitmann**

TU Bergakademie Freiberg,  
Institut für Angewandte Physik

## **Synthesis and Characterization of High-k Materials and embedded Nanocrystals for Electronic and Photonic Applications**

Nanocrystalline materials play a major role in semiconductor research and development. Semiconductor industry made a step towards nanocrystalline dielectrics for MIM capacitors in DRAM and rf applications, as well as for gate dielectrics for sub 45 nm devices. Nanocrystalline glasses as host material for rare earth ions enhance the efficiency of up- and downconversion processes in photovoltaic applications. Semiconductor nanocrystals are discussed as candidates for nonvolatile charge storage devices. The unique material properties of nanostructures like enhanced electron-hole interactions, resonant energy transfer to rare earth elements, and stabilization of the favored crystalline phases become more and more important. A combination of the two described topics, nanocrystalline high-k dielectrics, like ZrO<sub>2</sub> and HfO<sub>2</sub>, and semiconductor nanocrystals, e. g. nanocrystalline Ge and Si, and different deposition techniques like chemical vapor deposition, rf-sputtering and sol-gel synthesis will be compared and their advantages and disadvantages for different applications will be discussed. The work in the described fields is assisted by a detailed characterization of the electrical properties of the high-k dielectrics itself in order to investigate deep traps in the dielectric material as well as trap and dipole related relaxation processes.

Alle Zuhörer sind ab 17:00 Uhr zum Kaffee vor dem Hörsaal eingeladen.