



Invitation

LMU-Seminar

Title: The topological crystalline insulator (Pb,Sn)Se: From its discovery to controlled surface-state manipulation
Speaker: Dr. Bastian Wojek (KTH Royal Institute of Technology, Sweden)
Time: Friday, June 5th 2015, 14:00
Place: WBGB/019

Abstract:

The study of topological properties of solids and corresponding phase transitions has received tremendous attention in the recent years. A particularly interesting class of materials are three-dimensional topological crystalline insulators (TCIs) where degeneracies in the surface electronic band structure are protected by point-group symmetries of the crystals.

The IV-VI narrow-gap semiconductors hosting such a TCI phase show an extraordinary tunability of their electronic structure. In particular the solid solutions (Pb,Sn)Te and (Pb,Sn)Se offer the possibility to tune the bulk band gap - and hence the topological properties - using extrinsic parameters such as composition, temperature or pressure.

Moreover, it has been predicted and shown recently that the (001) Dirac surface states can be gapped by means of a structural distortion at the surface. This offers a possibility to manipulate these states selectively---a prerequisite for the eventual realization of applications using topologically protected electronic states.

In this talk, our investigations of (Pb,Sn)Se using angle-resolved photoelectron spectroscopy (ARPES) techniques are reviewed. Topics ranging from the discovery of the TCI state, particularities of the surface states, the details of the bulk band inversion in the system, to the more recent developments are discussed. Results obtained by synchrotron-based surface- as well as bulk-sensitive angle- and spin-resolved photoemission techniques are presented. Yet, a particular emphasis lies on our systematic studies of the (001) surface states using laser-based ARPES.