X-ray Spectroscopy

XAFS investigation of charge state and local atomic geometry of Pt in the series of synthetic minerals.

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The aim of the present project is to characterize the charge state, electronic and local atomic structures of Pt in the key chemical systems, critically important for ore geology, geochemistry, and for material sciences. This project will benefit from our experience in the synthesis and crystal growth of chalcogenides. Using the novel synthesis methods developed by members of our team we have synthesized all possible crystalline compounds in the systems: Pt-S, Pt-Se, Pt-As, Pt-Sb, Pt-Bi, Pt-In, Pt-Ga, Pt-Sn and some other compounds. Most of these compounds are synthetic analogues of natural minerals and characterized by powder X-ray diffraction. In the current project we measured X-ray absorption spectra at LI, LII and LIII edges for all 30 samples. We used EXAFS spectra for detail investigation of local atomic structure. XANES spectra were used to get information concerning electronic structure of Pt atom and its chemical bonding. Systematic comparison of the position and intensities of spectral features in XANES, calculated by DFT charge properties and valance states were carried out.

FEL-based study and THz radiation application

Carrier dynamics in doped Ge measured at the free electron laser facility FELBE

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Cooled germanium (Ge) photoconductive detectors are one of the most sensitive detectors at terahertz (THz) frequencies. They are widely used in laboratory spectroscopy and imaging experiments. The speed of a Ge photoconductive detector is set by technical limitations such as the bias circuit, the geometry of the detector crystal and the electric field applied to the .detector. The recovery speed of the detector material is, however, fundamentally limited only by the lifetimes of the intraband relaxation of the free charge carriers within the valence or conduction band and by band-to-impurity relaxation (capture) down to the impurity ground state. Therefore, capture and intraband relaxation processes have been measured for different dopants in uncompensated and compensated n- and p-type Ge by a pump-probe technique at the free electron laser facility FELBE.

FEL-based study and THz radiation application