

Ultrafast soft x-ray spectroscopy: Microscopic insights towards novel function

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The microscopic mechanisms which determine technological applications in diverse fields like data storage or energy conversion occur on time scales which represent their interaction strength. For example, the coupling of electrons, their spins, and the crystal lattice occur on energy scales of 10 to several 100 meV, which implies that they occur on sub-picosecond timescales. The corresponding phenomena are considered *ultrafast*. Experiments in the time domain are, by now, regarded as very rewarding because one can follow how the interactions modify the material properties while they act. As a result, various kinds of solid-state spectroscopies are by now available in the ultrafast time domain.

In this talk recent results obtained at user facilities like the synchrotron light source BESSY II, the European X-ray Free Electron Laser, and the SLAC-MeV Ultrafast Electron Diffraction Instrument will be discussed for heterostructures, bulk ferromagnets, and organic systems.