Ultrafast manipulation of magnetic, electronic and crystal structure probed by x-rays

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The understanding of electronic and structural phase transitions is of basic importance in condensed matter physics. In this presentation, I will concentrate on phase transitions that can be triggered externally by electronic excitations. The goal is to understand how and how fast we can trigger electronic transitions and how they might couple to structural motions of the atomic lattice. These can be done using pump-probe schemes, with X-rays as a probe down to ultrafast time scales. I will present results performed on the slicing beamline at the SLS and the free electron laser facility LCLS. It shows how coherent atomic motion (phonons), are involved in the electronic phase transition from charge and orbitally ordered manganites and how we can describe its time dependence. I will also give an example of how ultrafast electric fields react with magnetic order in a multiferroic material [1].

References

1. Kubacka *et al*. Science **343**, 1333 (2014)

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