SFB1242

SFB 1242 Nichtgleichgewichtsdynamik kondensierter Materie in der Zeitdomäne

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

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Ultrafast lattice dynamics of 3d ferromagnets

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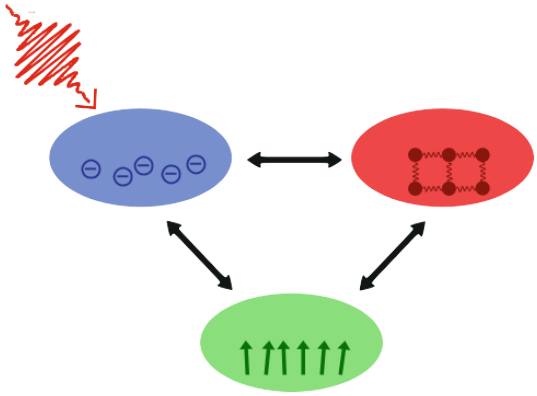
The behavior of ferromagnets after laser excitation is governed by the interplay of electrons, lattice and spins. In the case of 3d-ferromagnets, strong coupling between electrons and spins leads to ultrafast demagnetization on the femtosecond time scale. The lattice plays an important role in the magnetization dynamics, since it drains energy from the electrons on similar timescales and absorbs angular momentum from the spin system. Here, we study the lattice response of the 3d ferromagnets nickel, iron and cobalt directly using femtosecond electron diffraction (FED). To learn more about the energy flow between electrons, lattice and spins, we compare the experimental results to temperature models in combination with spin-resolved DFT calculations. While a regular two-temperature model (TTM) cannot describe the experimental results, we find excellent agreement using a modified TTM that assumes strong coupling between electrons and spins. In addition, we discuss how atomistic spin simulations can be employed to describe the spin system in out-of-equilibrium conditions. Our results suggest that the energy cost of ultrafast demagnetization has a strong effect on the lattice dynamics.



Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

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