Controlling and calibrating ultrafast energy transfer processes in metal nanostructures for ultrafast spin dynamics and light driven catalysis

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We investigate energy transfer processes within epitaxial and colloidal metallic nanostructures by quantifying the transport across material interfaces and the local mutual coupling of electrons, spins and phonons within each material. Unconventional forms of energy transport, e.g. heat transport without heating[1] and the dominance of phonon heat transport in the noble metal Au[2] initially observed via Ultrafast X-ray Diffraction (UXRD)[3] are exploited for tailoring the excitation of spin waves in ferromagnetic thin films[4] and the nano-localization of energy in catalytically active Palladium nano-spikes on colloidal gold. We combine the UXRD experiments with ultrafast all-optical methods that are sensitive to the electron and spin systems.

References:

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