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[230] Sub-picosecond transient absorption of PbS nanocrystals on gold

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We investigate the optical dynamics of PbS nanocrystal layers on a gold thin film by microscopy-based ultra-fast pump-probe spectroscopy. We probe with femtosecond resolution the transient absorption of nanocrystal films with specific thicknesses ranging from a few to 100 nm, as independently verified by atomic force microscopy. In stark contrast to individual nanocrystal and gold films, the combined system shows sub-picosecond dynamics depending on film thickness and probe wavelength. On basis of the observed parameter dependencies we discuss the models for the underlying charge dynamics in our semiconductor/metal system. While of interest for fundamental reasons, the thorough understanding of such effects is of importance for nanocrystal-based electrical and optoelectrical devices.

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