Photothermal effects in nanostructures: from ultrafast optical symmetry breaking to extreme heat dissipation

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Abstract

Electromagnetic radiation is absorbed inhomogeneously in differently shaped nanostructures. I will show how this phenomenon leads to a space-dependent out-of-equilibrium hot carrier population that breaks the optical symmetry of otherwise symmetrical nanostructures. The resulting asymmetric hot-carrier time dynamics can be exploited to manipulate light-matter interaction in the ultrafast regime. Electron-phonon scattering eventually induces heating, and I will show how properly designed large scale ultrathin (~250nm) metasurfaces allow extremely large (~GW/m^3) and broadband (~90% of solar spectrum) dissipated power densities.