Optical Control over Thermal Distributions in Topologically Trivial and Non-Trivial Plasmon Lattices

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Emergent from the discrete spatial periodicity of plasmonic arrays, surface lattice resonances (SLRs) are characterized as dispersive, high-quality polaritonic modes that can be selectively excited at specific points in their photonic band structure by plane-wave light of varying frequency, polarization, and angle of incidence. Room-temperature Bose-Einstein condensation of exciton polaritons, lasing, and nonlinear matter-wave physics have all found origins in SLR systems, but to date, little attention has been paid to their photothermal behavior. In this talk I will discuss our recent work in combining analytical theory and numerical calculations to investigate the photothermal properties of SLRs in periodic 1D and 2D arrays of plasmonic nanoparticles. Specifically, I will describe how to create steady-state SLR thermal gradients spanning from the nanoscale to hundreds of microns that are actively controllable using light in spite of heat diffusion. I will also examine the surprising ability to localize thermal gradients at the lattice edges in topologically non-trivial SLR dimer lattices, thereby establishing a class of extraordinary thermal responses that are unconventional in ordinary materials.