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Self-assembly of metallic nanoparticles into macroscopic, high-density, monolayer films JAKE FONTANA, NRC-NRL Postdoctoral Resident at Naval Research Laboratory , RON RENDELL, JAWAD NACIRI, BANAHALLI RATNA, Naval Research Laboratory — A vital element of bringing pragmatic optical metamaterials to fruition is the ability to produce and characterize macroscopic, self-assembled, high-density, ensembles of nanoparticles. We have developed a method that functionalizes metallic nanoparticles with thiol-ene ligands, self-assembles the nanoparticles into high-density, monolayer, centimeter size domain films using phase separation, transports the films onto substrates using surface tension gradients, and crosslinks, via click chemistry, the nanoparticles together into a solid film. We have determined the real and imaginary parts of the phase shift for the films using a Mach-Zehnder interferometer and spectrophotometer and compare the measurements to simulations. We discuss the implications of this self-assembly process for the construction of macroscopic optical metamaterials.

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