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**Negative Magnetic Response and Left-Handed Metamaterials in the Optical Domain Using Plasmonic Nanostructures** NADER ENGHETA, ANDREA ALU, ALESSANDRO SALANDRINO, University of Pennsylvania — Left-handed metamaterials, in which the dielectric function and magnetic permeability both possess negative real parts in a certain frequency region, have recently attracted a great deal of attention. In the microwave regime, such composite metamaterials have already been constructed by embedding arrays of metallic split-ring resonators and wires in a host medium. In the IR and visible regimes, however, synthesizing such LH materials faces certain challenges, since the magnetic permeability due to the molecular currents in a material tends to approach to the free space permeability at these frequencies. We theoretically study a design of nanoinclusions made of arrangements of plasmonic nanospheres exhibiting a resonant magnetic dipole response in the IR and visible domain. When such inclusions are embedded in a host medium, they may provide metamaterials with negative effective permeability at optical frequencies. Since the same inclusions may also provide resonant electric dipole response, combining the two effects at the same frequencies may lead to synthesizing left-handed materials at optical frequencies.

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