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Plasmonic metastructures exhibiting a narrow transparency window within a broad extinction spectrum LUCAS V. BESTEIRO, Department of Physics and Astronomy, Ohio University, HUI ZHANG, Department of Physics and Astronomy, Rice University, KIVANC GUNGOR, Institute of Materials Science and Nanotechnology, Bilkent University, HILMI VOLKAN DEMIR, Institute of Materials Science and Nanotechnology, Bilkent University; School of Physical and Mathematical Sciences, Nanyang Technological Univ., ALEXANDER GOVOROV, Department of Physics and Astronomy, Ohio University — Metallic nanostructures have proven to be a valuable resource in accessing new ways of manipulating light, allowing the creation of novel metamaterials with a number of different applications. By controlling the size and geometry of these structures they can be tailored to strongly interact with specific wavelenghts of incident light. We propose an approach to the design of composite systems that takes advantage of that property. Using finite elements calculations, we have studied several structure geometries suitable to be deployed using lithographic or colloidal synthesis techniques, such as discs, nanorods and nanocrosses. We discuss specific layouts of these structures, arranged in a modular fashion, to construct plasmonic metamaterials with a wide extinction profile that also present a transparency window for a narrow range of frequencies. This kind of metamaterials, made in the form of plasmonic metasolutions or as a stacked solid-state metastructure, may be used to create frequency filters for electromagnetic radiation. To realize this objective, it is instrumental to choose the right ensemble of nanostructures and to control the interaction between them.

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