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Mode coupling, Fano resonances, and Rabi splitting in hybrid nanostructure[1] DOMINIC BOSOMTWI, MAREK OSINSKI, Center for High Technology Materials, The University of New Mexico, VIKTORIIA BABICHEVA, Department of Electrical Computer Engineering, The University of New Mexico —
A metasurface is a thin, two-dimensional artificial array of optical nanostructures with subwavelength lateral dimensions. Metasurfaces have generated tremendous attention in recent years due to their planar configuration, lightweight, design simplicity, straightforward fabrication procedure, ease of integration into photonic devices, and ability to control electromagnetic waves. Because of these advantages, metasurfaces have been considered as promising candidates for numerous practical applications, such as sensing, beam steering, lenses, imaging, and solar energy harvesting. Here, we numerically study the scattering response of a periodic paired array of multilayer silver-silicon nanopillar metasurfaces using full-wave simulation. We design a hybrid silver-silicon multilayer array metasurface and realize Fano resonances and Rabi splitting in the spectral response of the nanostructures. We study the interaction between bright and dark modes excited in the unit cell of the nanostructure. It gives rise to asymmetric spectral profile in the absorption or reflection spectra, resulting in the excitation of Fano resonance. The coupling between two Fano resonance states in the nanostructure results in the observation of Rabi splitting.

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