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Indium Tin Oxide Nanorod Building Blocks for Near-Infra-Red Filter Metamaterials[1] SUNG HOON HONG, HUMEYRA CAGLAYAN, NADER ENGHETA, CHERIE KAGAN, University of Pennsylvania — We report arrays of indium tin oxide (ITO) nanorods function as near-infra-red (NIR) filter metamaterials. We fabricated arrays of rectangular cross-section, plasmonic ITO nanords of varying pitch, width, gap, and height of the nanorods using nanoimprint lithography and chlorine based inductively coupled plasma (ICP) etching processes. The transmission spectrum of the periodic nanorod arrays may be spectrally tuned in the NIR by the geometry of the arrays and the optical response depends on the polarization of the incident light. The nanorod array behaves as an optical nanocircuit. For illumination by an E-field vector parallel to the nanorod array, the array functions as a parallel L-C circuit, acting as a bandpass filter. For illumination by an E-field vector perpendicular to the nanorod array, the array functions as a series L-C circuit, acting as a bandstop filter. We show good agreement between optical measurements of fabricated nanorod arrays and simulations using equivalent circuit theory and finite-difference time-domain (FDTD) methods. The optical properties of the ITO nanorod circuit may be further tuned by filling the gap between the nanorods using various dielectric materials.

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