

Abstract Submitted
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Nonlinear Optical Effects in Periodic Arrays of Nanoholes in Metallic Films XIWEN WANG, Department of Chemistry, Northwestern University; Center for Nanoscale Materials, Argonne National Laboratory, STEPHEN GRAY, Center for Nanoscale Materials, Argonne National Laboratory, GEORGE SCHATZ, Department of Chemistry, Northwestern University — Extraordinary optical transmission (EOT) by periodic subwavelength apertures in metallic films has been much studied. Recent studies have shown that different aperture shapes can give quite different transmission spectra. For circular holes, EOT is often attributed to coupling with surface plasmons. Rectangular holes, however, can show more enhanced EOT and localized modes inside the holes, as opposed to plasmons, are often the dominant features. This implies that in the process of resonant transmission, light is highly concentrated inside the holes, which opens the possibility for exploring nonlinear effects. We use the finite-difference time-domain calculations to study the transmission properties of metallic films with arrays of rectangular subwavelength holes, each hole filled with a Kerr nonlinear material. We consider both the perfect metal limit and silver that supports plasmons. We analyze the transmission spectra as a function of incident intensity. Due to the large electric fields associated with the localized modes inside the holes, moderate incoming fluxes can result in dramatic changes in the positions of the transmission peaks.

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