

# Bragg scattering of surface plasmon polaritons on extraordinary transmission through silver periodic perforated hole arrays

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Extraordinary optical transmission through a two-dimensional periodic perforated Ag film in the far infrared region was demonstrated. When the squared hole size is close to a half lattice constant  $a/2$ , the split of the degenerate  $(\pm 1,0)$  Ag/Si and  $(0, \pm 1)$  Ag/Si modes into two peaks becomes apparent. Surface plasmon polaritons (SPPs) dispersion relations with variously sized square holes are measured to investigate the different surface charge fields at the periodic metal array. Strong scattering of the forward SPP waves, in the  $(1,0)$  Ag/Si mode, leads to a much lower transmission than that of in the  $(-1,0)$  Ag/Si mode. Experimental results demonstrate the photonic bandgap opens up when the size of the squared hole exceeds a half lattice constant  $a/2$ .

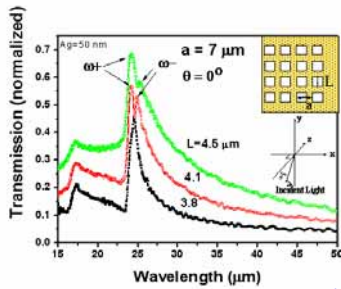


Fig. 1

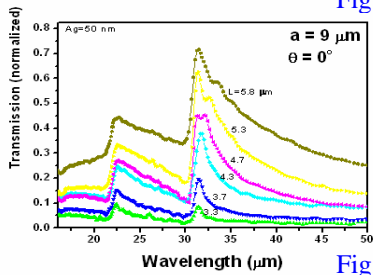


Fig. 2

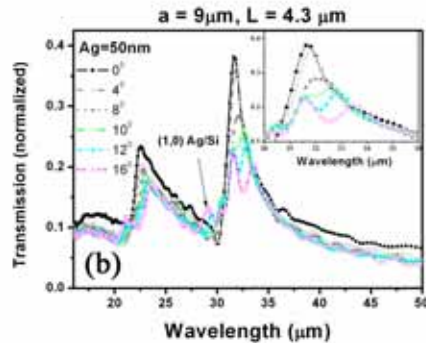
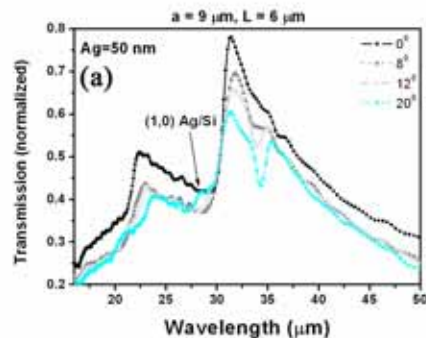


Fig. 4

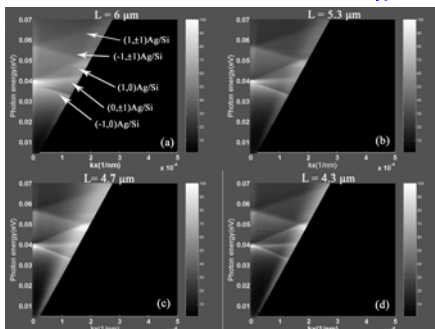


Fig. 3

~ This work will be published in *APL* (May 22, 2006). ~