

Waveguide-plasmon Resonances in Gold-capped Silicon-nitride Disk Photonic
Crystal Slabs

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Abstract

Waveguide-plasmon resonances of gold-capped silicon-nitride (SiN) disk photonic crystal slabs (PCSs) were investigated experimentally and numerically. The waveguide couplings were supported by the freestanding SiN membrane and the SiN-disk PCS. A tunable waveguide-plasmon resonance was modified by the SiN-disk height. When the SiN-disk height increased, the waveguide-plasmon resonances were enhanced and were blueshifted in optical-transmission spectra. The SiN-disk PCS was also fabricated to distinguish the presence of the waveguide-plasmon resonance in the gold-capped SiN-disk PCS from the guided resonance in the SiN-disk PCS. The finite-element method was used to calculate the optical transmittance of the gold disk array-coated SiN membranes, the gold-capped SiN-disk PCSs, and the SiN-disk PCSs. They were all in good agreement with the experiments.