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Abstract:We demonstrate an engineered composite film that dynamically switches resonant transmission behavior of terahertz radiation from bandstop to band-pass under appropriate optical pumping. In the absence of pumping, a resonant band-stop behavior is observed arising from metallic split-ring-resonators fabricated on an epitaxial silicon film that was already patterned into a periodic hole-array. Pumping with external infrared light, the silicon film becomes quasi-metallic, damping the planar metamaterial response and enabling a band-pass surface-plasmon resonance through the now conducting hole array. By leveraging two separate types of electromagnetic behaviors simultaneously, this composite chip paves a way for developing unique hybrid planar metamaterials. © 2011 Optical Society of America.
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