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Enhanced transmission through a periodic array of subwavelength apertures controlled by a semiconductor-metal phase transition
EUGENII DONEV, JAE YONG SUH, RENE LOPEZ, LEONARD FELDMAN, RICHARD HAGLUND, Vanderbilt University, VINSE TEAM — We present an experimental study on the tunability of the transmission spectrum through a periodic array of subwavelength apertures patterned on Ag-VO₂ bilayer film. The nano-structured composite film exhibits the known large optical transmission of a hole array in the metallic layer, but it is further enhanced when the VO₂ film becomes metallic after undergoing a semiconductor-to-metal phase transition ~ 67 °C. This result supports the theoretical explanation that the anomalous transmission is attributed to the resonant coupling of surface plasmon polaritons on both interfaces. The combination of metal and semiconductor-metal transition material gives not only further understanding of the enhanced transmission but also possibility of potential applications based on the transmission tunability. This research was supported by the NSF-NIRT program (DMR0210785) and the U. S. DOE NSET program (DE-FG02-01ER45916).

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