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Title:Terahertz modulator based on insulator-metal transition in photonic crystal waveguide
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Abstract:A terahertz modulator based on the insulator-metal transition (IMT) in a photonic crystal waveguide (PCW) coated by vanadium dioxide (VO_2) film is proposed. The numerical simulations show that a dielectric state and a metallic state with quite different photonic band structures and transmission properties in the proposed PCW are reciprocally converted because of the IMT of VO_2, and the pass-bands of this PCW are greatly shifted from 0.68 to 0.8 and 1.02 to 1.25 THz to 0.8-1.45 THz. This PCW significantly enhances the modulation depth and sensitivity compared with bare VO_2 film. Extensive investigation demonstrates that the thickness of VO_2 film greatly affects the IMT process in the PCW, and limits the ultimate modulation depth of the device. The proposed modulation scheme will be of great significance for potential THz applications.
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Inspec controlled terms:optical modulation - optical waveguides - photonic crystals - vanadium compounds
Uncontrolled terms:terahertz modulator - insulator-metal transition - photonic crystal waveguide - vanadium dioxide film - dielectric state - metallic state - photonic band structures - modulation depth - frequency 0.68 THz to 0.8 THz - frequency 0.8 THz to 1.45 THz - VO_2
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Numerical data indexing:frequency 6.8E+11 8.0E+11 Hz;frequency 8.0E+11 1.45E+12 Hz
Chemical indexing:VO2/bin O2/bin O/bin V/bin
Treatment:Experimental (EXP)
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