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Title:Tunable terahertz-mirror and multi-channel terahertz-filter based on one-dimensional photonic crystals containing semiconductors
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Abstract:We demonstrate that tunable terahertz-mirrors and multichannel terahertz-filters can be carried out by taking into account the transmission properties of the one-dimensional photonic crystals (1DPCs) containing semiconductor materials with a tunable dielectric constant in the THz frequency range. Using the semiconductor InSb as the components in the 1DPCs, we have designed such a mirror and a filter and identified their tunability. The THz-mirror is tunable by changing the external temperature or the thickness of the components of the 1DPC. The operation frequency of the multichannel-filter can be tuned by changing the temperature and thickness of the component materials in the 1DPC, the channel number of the filter can be controlled by varying the number of the defect layers in the 1DPC, and the transmittance bandwidth can be adjusted by changing the period number of the 1DPC. With thermal tunability, structure controllability and narrow bandwidth, 1DPCs containing semiconductors open a promising way to fabricate tunable terahertz devices for future terahertz communications.
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