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Title:Terahertz temperature-dependent defect mode in a semiconductor-dielectric photonic crystal
Authors:Hung, Hui-Chuan (1); Wu, Chien-Jang (2); Chang, Shoou-Jinn (1)
Author affiliation:(1) Institute of Microelectronics and Department of Electrical Engineering, Center for Micro/Nano Science and Technology, National Cheng Kung University, Tainan 701, Taiwan; (2) Institute of Electro-Optical Science and Technology, National Taiwan Normal University, Taipei 116, Taiwan
Corresponding author:Hung, H.-C.
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Abstract:In this work, terahertz (THz) temperature-dependent properties of defect mode in a defective semiconductor-dielectric photonic crystal (SDPC) are theoretically investigated based on the calculated transmittance spectrum. Two different defective PCs, the symmetric structure of (Si/SiO2) NInSb(SiO2/Si)N and the asymmetric one of (Si/SiO2)NInSb(Si/SiO2)N, will be considered. With a strongly temperature-dependent permittivity in defect layer InSb, the defect mode can be thermally tuned, that is, the defect frequency will be shifted to higher frequency as the temperature increases. With the inherent loss in InSb, the strength of defect mode will be strongly depressed at a higher temperature. We use the condition of impedance match to explain the presence of defect mode. The understanding of properties of defect mode could be of technical use in the terahertz optoelectronic applications.
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