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Abstract:We propose a semiconductor-graphene cylinder that can serve as a terahertz (THz) photonic crystal. In such a structure, graphene plays a role in achieving a strong mismatch of the dielectric constant at the semiconductor-grapheme interface due to its two-dimensional nature and relatively low value of the dielectric constant. We find that when the radius of the outer semiconductor layer is about ?<inf>1</inf> ∼ 100 μm, the frequencies of the photonic modes are within the THz bandwidth and they can be efficiently tuned via varying ?<inf>1</inf>. Furthermore, the dispersion relation of the photonic modes shows that a semiconductor-graphene cylinder is of excellent light transport properties, which can be utilized for the THz waveguide. This study is pertinent to the application of graphene as THz photonic devices. © 2012 Optical Society of America.
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