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Title:Broadband tuning multifunctional photonic crystal fiber for terahertz device

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Abstract:A theoretical study of liquid crystal filled photonic crystal fiber is presented. The effects of electric birefringence of liquid crystal in the liquid crystal filled photonic crystal fiber and the transmitting properties of photonic crystal fiber are investigated by using the full vector plane wave expansion and beam propagation methods. At the same time, finite different time domain method is used to calculate the change of liquid crystal molecules with the external electric field. The simulation results show that the electrically controlled liquid crystal filled photonic crystal fiber can act as a terahertz switch with about 0.55 THz bandwidth. It also has low coupling loss and high extinction ratio which is more than 30.78 dB. Furthermore, when the frequency of the incident terahertz wave meets some conditions, the device can control the polarization state of the incident terahertz wave.

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Main heading:Photonic crystal fibers

Controlled terms:Beam propagation method - Electric properties - Fiber optics - Liquid crystals - Switches - Terahertz waves - Time domain analysis

Uncontrolled terms:Electric birefringence - External electric field - Extinction ratios - Finite different time domain method - Liquid crystal molecules - Low coupling - Polarization state - Terahertz - Terahertz device - Theoretical study - Vector plane waves

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