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Temperature sensor based on Photonic crystal fiber

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In a photonic crystal fiber (PCF), the use of air hole as a core provides the ability to guide light in the air. The light is trapped in the defect in photonic crystal, as an application for this type of fiber, there is the high-energy transfer, endless single mode and fiber sensors, which measure physical parameters (temperature, pressure, force, etc.)

Many numerical tools exist to model the behavior of a PCF. Our choice has been on the finite domain-beam propagation method (FD-BPM). The Beam Propagation Method (BPM) is a numerical modeling method to simulate the propagation of a wave in a guide of arbitrary geometry. It can predict from an incident field distribution within a structure. The main idea of this method is to divide a structure into "slices" elementary, spacing with ΔZ and then determine the scope of a given slice from the one before. However, the equations to solve are complex, which leads us to adopt certain approximations.

Our contribution in this paper is to show the influence of temperature on dispersion properties of photonic crystal fibers infiltrated with water. This study were done by proving that the temperature had a direct effect on chromatic dispersion by infiltrating the air holes with liquid; we choose water as a liquid because it contains a large part of biological and chemical solutions. However, the dispersion properties of these water-filled PCFs have not been studied extensively.

Topics

Session C. Applied optics and engineering

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