Temperature and Magnetism Sensitivity of D-type Fiber Grating Filled with Magnetic Fluid in THz Band

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Abstract

A terahertz band temperature and magnetic field sensor based on a magneto-fluid-filled D-type microstructure grating is designed. The high sensitivity measurement of temperature and magnetic field is realized by optimizing the structure. The highest temperature sensitivity is 233.88 pm/°C, and the highest magnetic field sensitivity is up to 214.802 pm/mT. When the overall structure size of the sensor was changed by $\pm 0.1\%$, the maximal absolute deviation of temperature or magnetic field sensor are 0.018 pm/°C and 0.03 pm/Oe. At the same time, the dual-parameter demodulation matrix is used to effectively overcome the crosstalk problem.

Full Text

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Figures

Figure 1

Structure of the proposed D-type PCF

Figure 2

Transmission spectra of the D-type PCFBG

Figure 3

Transmission spectral of LPX (a, c) and LPY (b, d) evolution under different magnetic field and temperature

Figure 4

Curve of wavelength drift with (a) magnetic field and (b) temperature

Figure 5

Curve of wavelength drift with magnetic field and temperature after size change