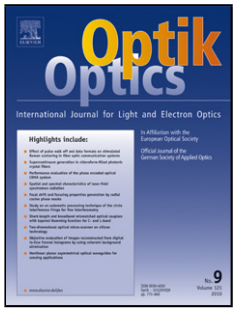

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Investigation on sensing characteristics of fiber Bragg gratings based on soft glass fibers

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Abstract: Soft glass fibers can transmit the wavelengths longer than 2 μm, which can realize the sensors in mid-infrared waveband. Compared to the FBG sensors based on silica fibers, FBG sensors based on soft glass fibers have the advantages of high sensitivity. For the first time, the sensing characteristics of FBGs based on different soft glass fibers are analyzed and compared. The sensing characteristics of temperature, strain and pressure of FBGs based on tellurite, chalcogenide and fluoride fibers are numerically simulated and compared. By analyzing and comparing a series of sensitivity curves of FBGs, we get some conclusions. For temperature sensing, the FBG based on the As_2S_3 fiber has the highest sensitivity coefficient of 175.7 pm/℃, while the FBG based on the silica fiber has the lowest sensitivity coefficient of 11.3 pm/℃. The Bragg wavelengths are red-shifted with the increase of temperature. For strain sensing, the FBG based on the β-ZnS (CVD) fiber has the highest strain sensitivity coefficient of 2.76 pm/με, while the FBG based on the silica fiber has the lowest strain sensitivity coefficient of 1.22 pm/με. The Bragg wavelengths are red-shifted with the increase of strain. For pressure sensing, the pressure sensitivity of the FBG based on the As_2S_3 fiber is the highest and the Bragg wavelength has is red-shifted; the pressure sensitivity of the FBG based on the silica fiber is the lowest and the Bragg wavelength is blue-shifted. These results will be significant for optical sensing and fiber lasers in mid-infrared waveband.