BRAGG GRATING BASED FABRY-PEROT INTERFEROMETER IN POLYMER FIBER FOR STRAIN AND HYDROSTATIC PRESSURE MEASUREMENTS

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In this work, we demonstrate a Fabry-Perot interferometer (FPI) based on a pair of Bragg gratings inscribed in a step-index PMMA fiber with a core made of PMMA/PS copolymer for strain and hydrostatic pressure. To ensure better quality of the grating reflection spectrum and thus the FPI response, the polymer fiber was annealed at 85°C for 5 hours prior to the inscription process. The gratings were fabricated with the use of the phase mask from Ibsen Photonics with a period of Λ=885 nm, customized for 325 nm writing wavelength. It allowed for the inscription of the gratings with the primary Bragg peak at λ_B=1312 nm in the PMMA/PS polymer fiber. To inscribe the gratings we used a CW He-Cd laser with a power of 30 mW. The UV beam was focused through the phase mask on the polymer fiber by a plano-convex cylindrical lens with a focal length of 75 mm, located at a distance of 75 mm from the fiber. The FP cavity was created directly during the inscription process by placing on the phase mask a narrow blocking aperture in the center of the UV beam. By choosing an appropriate thickness of the blocking aperture we could fabricate the FP interferometers with different number of fringes visible in the reflection spectrum of the Bragg grating. Moreover, good long-term stability and very sharp fringes (3dB width less than 60 pm) were obtained due to the fabrication of the FPI with FBGs of type II. The fabricated interferometers was tested for measurements of strain and hydrostatic pressure, respectively in the range of 0-20 mstrain and 0.1-10 MPa. We showed that the measurement resolution in this case is at least one order of magnitude better compared to the resolution obtained of the grating without the FP cavity.