Kinetic of Long Period Gratings UV-Induced and Sensing Characteristics

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Abstract. This work presents results concerning to the production and characterization of long-period gratings in optical fibres using the point-to-point writing technique with an ultraviolet laser. Long-period gratings, with a nominal period of 407 μm, were engraved in the core of hydrogen loaded photosensitive single-mode optical fibres. The loading was carried out by submitting the fibre to a pressure of 130 atm at room temperature along time intervals up to 20 days. During the writing process, long-period grating growth was monitored recording the transmission spectrum after each engraved point. After the end of the inscription process, the grating attenuation, resonant wavelength and bandwidth were still monitored along the time. Spectral changes were recorded during time intervals as longer as 595 hours, and an analysis of the grating's growth kinetic is presented. The long-period grating thermal and strain sensitivities were also determined and the results are presented. Long-period grating was also characterized for temperature changes within the range from 25 ºC to 425 ºC in consecutive up-and-down thermal cycles and hysteresis effects are discussed. The analysis of the grating strain response was done with the device submitted to longitudinal mechanical stress resulting in relative deformations ranging from 0 to 125 με in incremental steps of 25 με. The interplay between the cross-sensitivity is discussed as well as its role in the grating performance as a sensor.

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