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现代应用光学

应用800 nm飞秒激光制备长周期光纤光栅

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摘要： 利用800 nm钛蓝宝石飞秒激光器制备了长周期光纤光栅,并实验验证了长周期光纤光栅的高温特性。基于摄像头和电动位移平台设计了激光精确对准光纤纤芯的方案;以计算机控制1.3 mW飞秒激光,使用逐点曝光法在未经载氢处理的光纤上刻写了长周期光纤光栅,实验显示该光栅在1 200~1 700 nm波段的主谐振峰值可达-17 dB。利用高温箱对长周期光纤光栅进行高温传感特性实验,在300~800 ℃得到的主谐振峰温度响应灵敏度为0.056 nm/℃,线性度为0.992。实验结果表明,提出的以800 nm钛蓝宝石飞秒激光器制备长周期光纤光栅的方法稳定可靠,写制的光栅在高温环境下变化均匀,不易退化,响应特性良好,适用于高温检测。

关键词： 长周期光纤光栅 飞秒激光 光栅制备 高温传感

Inscription of long period fiber gratings using 800 nm femtosecond laser

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Abstract: Long Period Fiber Gratings(LPFGs) were inscribed by using a 800 nm femtosecond laser and their high-temperature properties were verified in this paper. Firstly, an inscription system for the laser into fiber cores was designed using a camera and an electric moving platform. With controlling a pulse laser of 1.3 mW, a LPFG was inscribed in a non-hydrogen-loaded bare fiber using point by point technique, and the resonant peak of the LPFG is about -17 dB in the 1 200~1 700 nm band. Then, high temperature sensing experiments were performed on the LPFG by a high temperature box, obtained results show that the linearity of the resonance peak changes is about 0.992 and temperature sensitivity is 0.056 nm/℃ at 300-800 ℃. It demonstrates that the inscription technology for LPFGs by using the 800 nm femtosecond laser is feasible and obtained LPFGs have good response characteristics and stability, and are suitable for the high-temperature measurement.

Keywords: long period fiber grating femtosecond laser grating inscription high-temperature sensing

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