

УДК 535.8; 535.015; 531.7

## THEORETICAL STUDY ON THE RELATIONSHIP BETWEEN TRANSMISSION INTENSITY AND TENSILE FORCE OF HELICAL LONG-PERIOD FIBER GRATING AT FIXED WAVELENGTH

Yong Tang, Jiacong Huang, Kemin Lv, Li Zhang, Yunfeng Bai

*This article uses the coupled-mode theory to analyze transmission intensity and the relationship between the tensile force at the fixed wavelength. It found that the transmission intensity and tensile force are linearly related. In the experiment, helical long-period fiber grating is fabricated by a welding machine. The relationship between the transmission intensity and the tensile force at 1530 nm wavelength is investigated experimentally, and results are consistent with the theory. In addition, we also studied the tensile force properties of three groups of different wavelengths, got the same conclusion. So many wavelengths in this relationship can be measured. This theory plays a guiding role in the research of new spiral fiber grating tension sensors.*

**Keywords:** helical long-period fiber grating, tensile force, coupling-mode theory, transmission intensity of fixed wavelength.

*Introduction.* Fiber grating sensor plays an important role in tensile force measurements [1, 3], refractive index [2], bending [3], and torsion [4]. For now, optical fiber sensors are mainly divided into fiber Bragg grating (FBG) [1–3] and long-period fiber grating (LPFG) sensors [4–12]. The coupling mode of FBG is the coupling between the fiber core and the fiber core. The mode of LPFG is the coupling between the fiber core and the cladding...

Поступила в редакцию 6 декабря 2021 г.

После доработки 1 июня 2022 г.

Принята к публикации 1 июня 2022 г.

---

Key Laboratory of Micro/Nano Optoelectronic Devices and Intelligent Sensing System, School of Electronic Information and Engineering, Yangtze Normal University, Chongqing 408100, China; e-mail: baiyunfeng@126.com.