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论文

# 一种同时测量电流和温度的光纤光栅传感器

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摘要：

提出了一种基于光纤光栅法布里-珀罗干涉仪且可以同时测量交变电流和温度的传感器,并对其进行了理论分析和实验研究.该传感器采用单频激光入射,作为反射镜的一对光纤布喇格光栅自由放置,其间的法布里-珀罗腔粘贴在磁致伸缩材料上,通电导线周围的磁场通过磁致伸缩材料作用于光纤光栅法布里-珀罗腔,引起腔长周期性变化.同时,由于热膨胀和热光效应,环境温度的变化会引起光纤长度和折射率的改变,从而改变光纤光栅法布里-珀罗腔的反射光谱特性.通过检测输出光信号的频率和峰值可实现电流和温度的同时测量.对通电线圈的电流及环境温度进行测量的实验结果与理论分析相吻合.

关键词： 光纤传感器 光纤布喇格光栅 法布里-珀罗干涉仪 电流传感器 温度传感器

## Fibre Bragg Grating Sensor for Simultaneous Measurement of Current and Temperature

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Abstract:

A fiber optic sensor based on Fiber Bragg Grating (FBG) Fabry-Perot Interferometer (FPI) is designed and experimentally demonstrated for simultaneous measurement of alternating current and temperature,in which a laser with single-frequency is used as the light source.The cavity of the FPI is affixed to magnetostrictive material and the pair of (FBG) as the cavity reflectors is placed freely.The length of the cavity is changed cyclically due to the influence of magnetic field around the current on magnetostrictive material,and the peak reflectivity of the FPI is affected by the temperature because of the thermal expansion and the thermo-optic effect.Theoretical analysis indicate that,the temperature and the current can be simultaneously measured by detecting the peaks and frequences of the signal.The experimental results of measuring the current of a coil and the environmental temperature agree well with the theory.This sensor has a wide application prospect due to its simple manufacture and easy demodulation.

Keywords: Fiber sensor Fiber Bragg Grating(FBG) Fabry-Perot interferometer(FPI) Current sensor Temperature sensor

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