

一种新型光纤布拉格光栅气体泄漏检测传感器

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摘要:

提出了一种新颖的基于光纤自加热效应的气体泄漏检测用传感器, 不仅可对管道连接处等易发生泄漏的部位进行实时监测, 还可提供定量的有关管道泄漏速度的数据。泄露到光纤外部的泵浦光能被附着在光纤光栅外部的金属涂敷层吸收, 导致温度上升, 改变了光栅的栅格周期, 进而影响了光栅的谐振波长。当有气流通过光纤光栅时, 由于热量被带走, 导致光纤光栅温度变化, 通过监测谐振波长的改变即可求得气体的泄漏速度。为简化信号解调方法, 利用长周期光纤光栅的边沿滤波器特性, 实现光纤光栅传感波长的解调。实验通过控制CO₂的流速, 证实了该方法的可行性。

关键词: 光纤布拉格光栅传感器; 气体泄漏检测; 线性解调; 光电探测器

A Novel Fibre Bragg Grating Gas Leakage Detection Sensor

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Abstract:

A novel gas leakage detection sensor based on self-heated effect of fibre optic is presented. It can be used to monitor the brittle juncture of pipeline in real-time, also it can provide quantitative data about gas leaking velocity. The optical energy leaking out from the fibre is absorbed by the metallic coating, which raise the temperature and alter the grating pitch of the fibre Bragg grating (FBG). When gas leaking out from the pipeline blow on the fibre grating, its temperature changes accordingly. The gas leaking velocity can be determined by monitoring the change of resonance wavelength. Based on the filter characteristic of long-period grating (LPG), the wavelength-change of sensing grating can be demodulated. The validity of this grating gas leakage detection sensor has been experimentally proved by means of controlling the velocity of CO₂.

Keywords: fibre bragg grating sensor, gas leakage detection, linear demodulating, photoelectric detector

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