

光纤技术

## 一种基于谐波检测技术的光纤甲烷气体传感器

王书涛<sup>1</sup>, 刘瑾<sup>2</sup>, 车仁生<sup>1</sup>, 王玉田<sup>2</sup>

1.哈尔滨工业大学, 哈尔滨 150001; 2.燕山大学 电气工程学院, 河北 秦皇岛 150001

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摘要

甲烷是易燃易爆气体,是矿井瓦斯及天然气等多种气体燃料的主要成分. 气体爆炸一直是困扰煤矿安全生产的重大难题,因此现场实时检测甲烷气体浓度对于工矿安全运行, 人身安全有着至关重要的作用.基于甲烷气体近红外吸收的机理,研究了一种以DFB LD为光源的高灵敏度光谱吸收型光纤甲烷气体传感器.利用光源调制实现气体浓度的谐波检测, 用二次谐波与一次谐波的比值来消除光路干扰.建立了谐波检测的数学模型,给出了甲烷气体的测量结果. 利用光纤作为传光通道,使得探头可以与测量电?肥迪滞着 缙衾?增强了系统的安全性.

关键词 [气体传感器](#) [甲烷](#) [调制](#) [谐波检测](#)

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## A Methane Gas Sensor with Optic Fiber Based on Frequency Harmonic Detection Technique

WANG Shu-tao<sup>1</sup>, LIU Jin<sup>2</sup>, CHE Ren-sheng<sup>1</sup>, WANG Yu-tian<sup>2</sup>

1.Harbin Institute of Technology, Harbin 150001, China; 2.Institute of Electrical Engineering, Yanshan University, Qinhuangdao 066004, China

Abstract

Methane is an inflammable and explosive gas and a major constituent of mine atmospheres, natural gas and gas fuels. Because gas explosion is a big problem in mining industry, real-time and on-line detection of methane has a critical function both for safety assessment and for control of combustion processes. Based on the mechanism near infrared spectral function both for safety assessment and for control of combustion processes. Based on the mechanism of near infrared spectral absorption of methane, a system using absorbent type optic-fiber for high sensitivity methane detection with DFB LD is demonstrated. Light source modulation harmonic measurement is presented in this paper. The ratio of the fundamental and second-harmonic signal presented can be used for eliminating optical interference. The mathematical model of gas concentration harmonic measurement is built up. The result of methane concentration is also shown. Optical fiber is used as transmission medium, thus the sensor part and measurement circuit can be isolated completely. The safety of the systems is enhanced.

Key words [gas sensor](#) [methane](#) [modulation](#) [harmonic measurement](#)

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通讯作者 王书涛

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