

Modified optical fiber sensor for dangerous chemical detection

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Abstract

Gaseous pollutants such as Ammonia are ubiquitous in daily human activities and widely used in many applications. It is extremely toxic, explosive, flammable and corrosive in certain conditions. The inhalation of ammonia is deadly. Many fatal accidents are reported annually due to the ammonia leakages. Liquid pollutants like Ethanol (C_2H_5OH), is a volatile organic compound (VOC) that is commonly used in the food, beverage, fuel and pharmaceutical industries. Ethanol is extremely flammable and may explode upon mixtures with air or in a fire. Exposure to high concentrations of ethanol may cause intoxication, irritation to the skin and inflammation of the nasal mucous membrane. Common gas and liquid detectors are electrical based. Although these sensors attain high sensitivity, localized electrical sensors suffer from drawbacks that include prone to EMI, poor selectivity, high operating temperature (100 - 300°C), and limited environment. Optical fiber sensors present advantages in certain aspects as compared with electrical sensor, such as they are Lightweight, Immune to electromagnetic interference (EMI), Suitable for volatile & flammable environment, suitable for remote monitoring system (approx. 3 km), room temperature operation, energy saving, competitive cost, high sensitivity and selectivity, and fast response and recovery (<one minute). Presently, nanotechnology enabled chemical sensors have been increasingly used to enhance the sensing performance. Modified optical fibers were selected as the transducing platform for the sensor because of its low cost, ease in fabrication, and suitability for remote sensing applications. The sensors fabrication processes were efficient and simple. The modified sensors were integrated with nanomaterials as the sensing layer. The superior sensing performance shown by the developed optical devices via low cost and simple techniques indicate their high potential as compared to the conventional sensor for pollutants detection in various industrial applications at room temperature.

Biography:

Ahmed Lateef khalaf received his B.Sc Eng. degree (Control and Systems Engineering) from University of Technology, Iraq (2001) and M.Sc. Eng, degree (Computer Engineering) from Middle Technical University, Iraq (2008). He did his PhD research at Universiti Putra Malaysia, Malaysia, (2018) in the area of optical sensor based on nanomaterials for chemical sensing applications. Currently, he is a senior lecturer at the Department of Computer Engineering Techniques and Director of Scientific Division, Al-Ma'moon University College. His main research interests are fiber optics sensors, optical chemical sensors, nanomaterials, and computer engineering...

Citation: Ahmed Lateef Khalaf; Modified optical fiber sensor for dangerous chemical detection;3rd international conference on Sensors and Electronic Instrumentation; May 22, 2021