Review of the scientific article

FIBER-OPTIC SENSORS FOR MONITORING GAS LEAKS AND TEMPERATURE IN INDUSTRIAL FACILITIES

The reviewed scientific article examines the theoretical foundations and practical applications of fiber-optic sensors for detecting gas leaks and monitoring temperature in industrial environments. In the introduction, the author convincingly substantiates the relevance of the study, which is driven by the increasing requirements for industrial safety, environmental protection, and the need for highly accurate and reliable monitoring systems in complex technological infrastructures. It is emphasized that traditional monitoring methods often fail to provide sufficient sensitivity, spatial coverage, and operational efficiency, particularly in large-scale or hard-to-access facilities, which highlights the importance of fiber-optic technologies.

The main body of the article presents a detailed and systematic analysis of fiber-optic sensing principles, their classification, and signal modulation techniques, including amplitude, phase, and frequency modulation methods. The author consistently describes the functioning of distributed sensing systems such as DAS, DTS, and FBG, demonstrating their capabilities in real-time detection of gas leaks and temperature variations. Significant attention is given to the physical principles of optical fiber operation, including light propagation effects, spectroscopy, and interferometry, as well as to the integration of fiber-optic systems into modern industrial monitoring infrastructures. The advantages of fiber-optic sensors are clearly outlined, particularly their high sensitivity, immunity to electromagnetic interference, resistance to harsh environments, and strong potential for integration into digital industrial ecosystems and IoT-based monitoring systems.

In the concluding section, the author summarizes the findings and confirms the high efficiency of fiber-optic sensor technologies in industrial safety and

monitoring applications. At the same time, the limitations of the technology are acknowledged, including high implementation costs, complexity of signal processing, and challenges in system integration. The article also outlines promising development directions such as intelligent data analysis, miniaturization, improved selectivity, and standardization, which are crucial for broader industrial adoption.

Overall, the article is characterized by a high level of scientific rigor, logical structure, and strong practical orientation. The material presented in the article has high scientific significance and practical value. The author demonstrates a deep understanding of the subject. It is recommended that the author consider expanding the discussion by including additional examples of real-world industrial implementations and comparative performance analyses of different fiber-optic sensing technologies, which would further strengthen the practical impact of the study. The article meets all the requirements for scientific publications and is recommended for publication in the journal.

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