

HYDROGEN SULPHIDE SENSING REVIEW

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Abstract. *This paper reviews few of the most commonly employed sensing structures for hydrogen sulphide detection. Categories of sensors such as semiconductor metal oxide, electrochemical, optical (including colorimetric), conducting polymers, piezoelectric (including quartz crystal microbalance and surface acoustic wave) are discussed in terms of principles, materials used as sensing layers and performance.*

Keywords: Sensors, Dosimeter, Hydrogen Sulphide, Metal Oxide Semiconductor, Colorimetric, Surface Acoustic Wave

1. Introduction

Hydrogen sulphide (H₂S) is a flammable, irritating, corrosive, typically bad-smelling and extremely toxic gas. The toxicity of H₂S is comparable with that of hydrogen cyanide, which is considered a broad-spectrum poison. At concentrations higher than a few ppm in air, H₂S is a very toxic gas for people, with harmful effects on respiratory and nervous system. Actually, its maximum threshold limit value (TLV) is 1 ppm for eight-hour a day exposure, while short term exposure limit (STEL) is 5 ppm, but these values, as imposed by international regulations and legislation, are decreasing every year. This explains the strong health safety environment (HSE) regulations for monitoring this gas in all industrial areas where this may be present. H₂S is generated by oil and gas industry during crude oil extraction, its refinement and transportation, as well as by the decay of organic matter in septic sewers systems [1]. In North America only, well over 150,000 workers are exposed or potentially exposed to H₂S every year. Thus, it is of crucial importance to permanently monitor the H₂S level and provide safeguards for the employees who work in refineries and petrochemical plants.

The detection of the H₂S can be performed by means of either chemo-resistive, electrochemical (amperometric or potentiometric), conducting polymers, optical (including colorimetric) or piezoelectric principles. The first two approaches have been available at commercial level for about five decades.

2. Common sensors types employed for H₂S sensing

For the detection of hydrogen sulphide, chemical, electrochemical and physical principles have been used, so far. In this chapter, the latest data regarding material and device research for increasing the stability, sensitivity and accuracy of such sensing structures will be presented.