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Abstract

Polyaniline Nanocomposites for Hydrogen Sulfide Detection at ppb Level †

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Abstract: Coming from natural and anthropogenic sources, hydrogen sulfide gas (H_2S) is a smelly hazardous substance at the sub-ppm level, which can lead to poisoning deaths at higher concentrations. New sensors with high metrological properties (detection limit lower than 1 ppm) and good stability are still needed to monitor and control the risk associated with this gas. The properties of a high-performance hydrogen sulfide gas sensor based on tin oxide and conductive polymers (polyaniline and poly(3,4-ethylenedioxythiophene):polystyrene sulfonate (PEDOT:PSS) are investigated. The principle of detection of this resistive sensor consists of a two steps reaction. H_2S reacts with tin oxide producing hydrochloride acid, which dopes polyaniline, leading to the increase of its conductivity. Those systems present high repeatability and reproducibility, with sensitivities around 10%/ppm and a limit of detection close to 30 ppb. Moreover, the effect of interfering species such as humidity and oxidative gases (ammonia) is addressed. Those species have a limited impact, corrigible by data treatment. Finally, the sensors present an increase of sensitivity with time, apparently due to the modification of the interface between the electrodes and the sensitive materials.

Keywords: gas sensing; hydrogen sulfide; conductive polymer; resistive sensor

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