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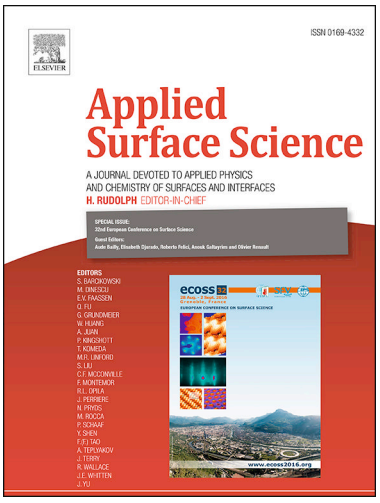

Full Length Article

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The performance of inkjet-printed copper acetate based Hydrogen sulfide gas sensor on a flexible plastic substrate - varying ink composition and print density

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1 Abstract

Low-cost and robust hydrogen sulfide (H_2S) gas sensors can be utilized in different industrial applications. Earlier we have demonstrated an inexpensive wirelessly readable copper acetate based H_2S gas sensor which was successfully employed for monitoring the quality of raw poultry. In this study we have thoroughly investigated and optimized the performance of inkjet-printed copper acetate based H_2S gas sensor on flexible plastic substrate at room temperature. The effect of ink composition, print density, number of print nozzles and temperature of the substrate on sensor performance was tested. The long term stability of these sensors after exposure to H_2S was studied extensively and was optimized as a function of the print density of copper acetate. The conversion of copper acetate to copper sulfide upon reaction with H_2S was established by x-ray photoelectron spectroscopy. We believe that the optimized sensor developed in this study with respect to stability, repeatability and material consumption will pave the way for the commercial use of these sensors e.g. in food quality monitoring and environmental applications.

2 Introduction

Low-cost gas sensors and indicators have attracted a lot of attention in the recent years. Gas-sensitive films have been developed for potential use in e.g. healthcare and diagnosis, food quality control, defense, anti-terrorism and environmental controls et cetera. Among different gases, hydrogen sulfide (H_2S) is responsible for many incidents of occupational toxic exposure. [1] H_2S is a toxic and flammable gas and the clinical effects of H_2S depend on its concentration and the duration of exposure. [1] Although H_2S has a distinctive rotten egg smell, above concentrations of 100 ppm it is practically undetectable by smell due to saturation of olfactory nerves. H_2S