Gas sensing applications on intelligent food packaging, control of air quality and detection of explosive energy-related gases

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ABSTRACT

Gas sensors have attracted the research interest for over 50 years due to the broad field of applications. As result various methods such as conductometric, optical, surface acoustic waves (SAW) etc. have been employed to detect gases and/or volatile organic compounds (VOC's). In addition, a great number of materials have been investigated as gas sensing elements against gases, in order to achieve high sensitivity, low detection limit, fast response and recovery time and high selectivity.

In the present work, conductometric gas sensors were applied on control of air quality (O_3, NO_2), intelligent food packaging (CO_2) as well as on the detection of explosive energy-related gases (H_2 and CH_4). Metal oxide as well as copper thiocyanate(CuSCN)-based gas sensors grown either by sputtering technique or by hydrothermal synthesis were successfully tested against the above mentioned gases, showing high and fast response. More specific, hydrothermally synthesized Cu_2O successfully detected 10 ppb O_3 with a response of 28%, at room temperature, having response and recovery time less than 30 s **[1]**. By using the same sensing element, 5% (50000 ppm) of CO_2 were detected at room temperature, with a response time of about 90 s. Furthermore, the sensor was achieve to maintain its response to CO_2 after being stored in the fridge for 20 days, indicating its ability to be an excellent candidate for intelligent food packaging technologies **[2]**. Finally, CuSCN-based gas sensors were tested against H2 gas, showing a response of 179% at 1000 ppm, with a response time of 400 s, at room temperature, while it was operated under low applied voltage of 0.1 V **[3]**.

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