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Detection of Hydrogen and NO_x Gases Based on a Thermoelectric Gas Sensor with an Embedded Tin Oxide Catalyst

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In this paper, we report a micromachined thermoelectric gas sensor with an embedded catalyst that can be used for gas sensing applications. The proposed sensor can detect the target gas by measuring heat from the catalytic reaction on the surface of the catalyst, tin oxide in this case. By using the thermoelectric effect, decreased response and recovery times can be obtained. To increase the sensitivity of the sensor, the thermal components of the proposed gas sensor are fabricated on a high-thermal-resistivity layer, SU-8 in this case, which led to the reduction in the rate of parasitic heat transfer to the substrate. In order to verify the thermal characteristic of the fabricated sensor, the intensity of output signals depending on the temperature differences between the hot and cold junctions was measured. The sensor response to the temperature change was 4.61 V/W. Hydrogen and NO_x gases were detected by the proposed sensor. The change in output signal intensity depending on hydrogen gas concentration was 1.06×10^{-1} μV/ppm, and the change in output signal intensity depending on NO_x gas concentration was 1.50×10^{-1} μV/ppm.

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