Non-heating Room Temperature SnO_2 Gas Sensors

Qiangu Yan[1,2], Xiuying Liu[1]
[1]Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun, Jilin, 130022, P.R.China
[2] Center for Advanced Vehicular Systems, Mississippi State University, Starkville, MS 39759

1. Introduction

Semiconductor oxide SnO_2 has been extensively used in gas sensor application due to its high capacity to adsorb gaseous species and change its surface conductivity when promoting the reactions. However, SnO_2 sensors have some disadvantages, such as poor selectivity and high working temperatures. Many research attempts to avoid these problems have been done. A non-heating room temperature gas sensor was prepared from SnO_2, α-Fe_2O_3, SiO_2, and ErO_2. The sensor performance was investigated to different gases such as H_2, CO, LPG, and CH_4. The relationship of adsorbed oxygen species on the surface of SnO_2 at different temperature with gas sensing property was also studied.

2. Experimental

A sensor sample was prepared by adding α-Fe_2O_3, SiO_2, and ErO_2 to SnO_2. The power was grinded and then were heat-treated at 680 °C for 45~50 min in a nitrogen flow. The sensors was aged overnight before testing.

3. Results and Discussion

The non-heating SnO_2 sensors show high sensitivity to H_2, CH_4 and LPG at room temperature with low power consumption. However, the sensors are not sensitive to CO. The resistance of the sensor between room temperature and 250 ^oC was measured and it was found the sensor had a minimum resistance at 120 ^oC. The oxygen species over the sensor sample are mainly OH^- and O^{2-}. Results indicated that the greater the specific surface area of the gas sensing sample is, the more adsorbed surface OH^- (O^{2-}) and the better performance of the sensor.

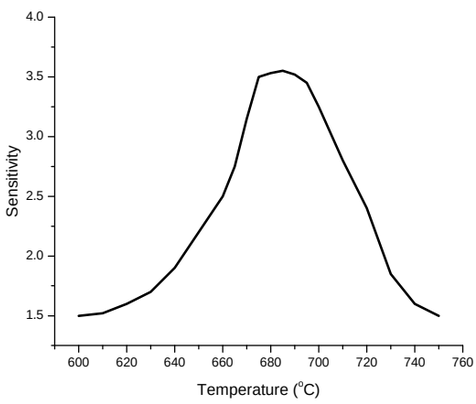

Fig1. Effect of sintering temperature on the sensor sensitivity

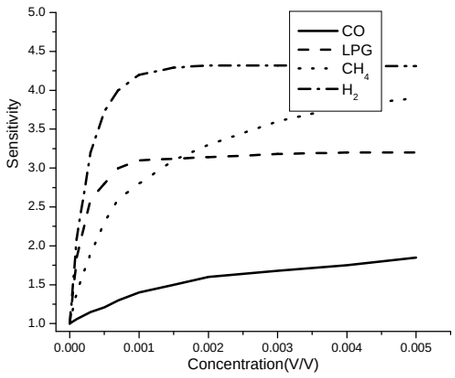

Fig.2 Sensor sensitivity to different gases

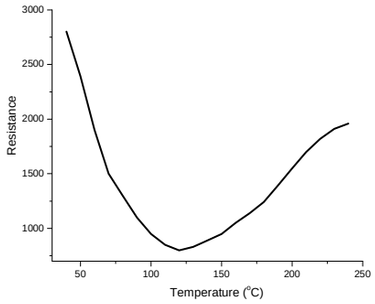

Fig.3 Sensor resistance with temperature