Nanocomposites and Nanomaterials

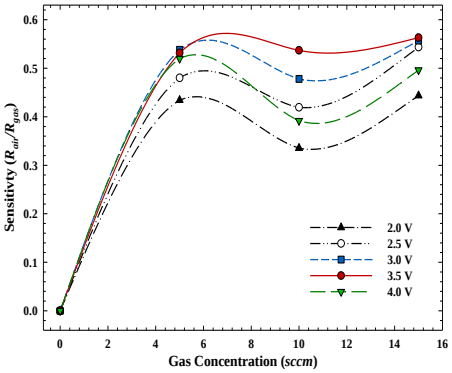
The Properties of Low Temperature Operated In_2O_3 Gas Sensor for Butane Sensing

T. Asar[1,2,*], S. Özçelik[1,2]

[1] Physics Department, Faculty of Sciences, Gazi University, 06500, Ankara, Turkey
[2] Photonic Application and Research Center, Gazi University, 06500, Ankara, Turkey
** Corresponding Author: trkasar@gazi.edu.tr*

In_2O_3 thin films have been extensively studied as a material of chemical sensing devices for a long time [1]. A chemical sensing device plays a crucial role in detecting the presence of hazardous and poisonous gases in the environment at very low concentrations [2]. This kind of device rapidly responds to that gases and translates them into the appropriate physical signals, so as to take safety precautions [3].

In this study, the effect of Butane concentration was investigated on the sensitivity of the In_2O_3 gas sensor. The un-doped *In_2O_3* thin film was deposited on the n-type *Si (100)* substrate by RF magnetron sputtering technique at room temperature. The thin film was sputtered at *100W* RF power with the thickness of *95 nm* by using an *In_2O_3* ceramic target (purity of *99.98%*). The thickness of the thin films was confirmed by a stylus type profilometer. After deposition of the thin film, the fabrication processes were completed with the formation of interdigital electrodes. These electrodes were formed by the deposition of *Ti* and *Au* metals with the thickness of *30 nm* and *270 nm*, respectively. The gas sensor was tested with the different Butane gas concentrations (*0, 5, 10 and 15 sccm*) and applied voltages (*2.0, 2.5, 3.0, 3.5 and 4.0 V*) at *100°C* operating temperature.



The results showed that, the best properties of the gas sensor were obtained in the *15 sccm* Butane concentration at *3.5 V* applied voltage.

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