DOI 10.1007/s12647-017-0233-5

Tungsten Oxide Thin Film Characterizations for Acetone Gas Detection

S. Sachdeva[2]*, A. Agarwal[1] and R. Agarwal[2]
[1]CSIR—Central Electronics Engineering Research Institute, Pilani 333031, India
[2]Thapar University, Patiala, Punjab 147001, India
*Corresponding author, E-mail: ssmiti27@gmail.com

Received: 17 May 2017 / **Accepted:** 10 October 2017 / **Published online:** 26 October 2017

Abstract: The gas sensing properties and topology of tungsten oxide thin films deposited by reactive-ion radio frequency magnetron sputtering at room temperature have been investigated. The abnormalities in behaviour of sensing film are observed when acetone gas is flowed over surface. The reduction reaction of surface and oxidation reaction of acetone gas have been studied. As the gas comes in contact with the surface, the molecules tend to reduce the surface, hence decreasing the resistance. The sensing film was annealed to 500 C for 1 h for the purpose of achieving a suitable grain size for sensing to take place. Operational optimum temperature for sensing has been computed to be 260 C. A grain size of 7.3 nm has been computed through analysis of AFM image and a film thickness of 100 nm has been calculated through surface profiler. The SEM image of the film demonstrates the grains developed on the surface. The XRD patterns reveal that the oxide showed up as WO2. It has been observed that the response percentage is approximately 30% for acetone vapour concentration of 20 ppm and approximately 18% for the concentration of 15 ppm. The response time of the sensor is approximately 5 min and the recovery time is 4 min.

Keywords: Tungsten oxide thin films; Surface metrology; Topography; Gas sensing; Acetone gas detection