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On the synthesis and characterization of Tungsten Oxide (WO₃) doped with Carbon Nanotubes (CNTs) nanostructures for gas sensing applications

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There is a considerable desire to control and monitor gas emissions from industries like in mining and energy industries where fossil fuels are used to generate electric power. Most gases emitted from these industries are not environmental friendly since they result in air pollutions, acid rains and global warming. Gas sensors have been reported as promising devices to resolve these issues. In this study a DC magnetron sputtering is used to synthesis tungsten oxide (WO₃) doped with carbon nanotubes (CNTs) nanostructures on silicon substrates for gas sensing applications. CNTs are grown on top of WO₃ nanoparticles for improving gas sensing properties of WO₃. Crystallinity and porosity of the sensor material is expected to enhance the sensitivity and selectivity of the fabricated gas sensor. The structural, morphological and composition were investigated using XRD, SEM equipped with EDS. SEM results shows small size (in nanoscale) of WO₃ particles evenly distributed on silicon substrate with some small spaces in between which is promising for gas adsorption. EDS results confirmed the WO₃ composition. Due to the spacings between these nanoparticles of WO₃, it is therefore expected that the gas sensing properties of this material will improve. This is due to the fact that gas will be easily be adsorbed between the nanoparticles.

Summary

In this study WO₃ nanostructures were successfully deposited on silicon<100>/<111> substrates using DC magnetron sputtering. WO₃ films were deposited under various substrate temperatures (450 °C, 500 °C, 600 °C and 700 °C) for successful crystallization of WO₃ films. These films were then characterized by the SEM equipped with EDS and XRD. The balance crystallinity and porosity properties of WO₃ nanoparticles were achieved at 500 °C and due to these properties WO₃ is expected to show good gas sensing properties. Gas sensing properties of WO₃ will be measured using kinosistec system, and WO₃ film is expected to show a good sensitivity and selectivity to NO₂ gas. Doping WO₃ with CNTs is expected to show good improvement of gas sensing properties of WO₃ material.

Apply to be considered for a student award (Yes / No)?

No

Level for award (Hons, MSc, PhD, N/A)?

N/A

Main supervisor (name and email) and his / her institution

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**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

No

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