

# Accepted Manuscript

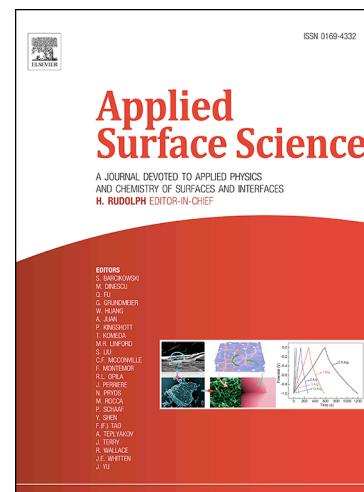
Full Length Article

Tuning the morphology of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films by RF magnetron sputtering for room temperature sensing application

S. Ponmudi, R. Sivakumar, C. Sanjeeviraja, C. Gopalakrishnan, K. Jeyadheepan

PII: S0169-4332(18)32853-8  
DOI: <https://doi.org/10.1016/j.apsusc.2018.10.096>  
Reference: APSUSC 40664

To appear in: *Applied Surface Science*



Please cite this article as: S. Ponmudi, R. Sivakumar, C. Sanjeeviraja, C. Gopalakrishnan, K. Jeyadheepan, Tuning the morphology of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films by RF magnetron sputtering for room temperature sensing application, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.10.096>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Tuning the morphology of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films by RF magnetron sputtering for room temperature sensing application

S. Ponmudi,<sup>a</sup> R. Sivakumar,<sup>b,\*</sup> C. Sanjeeviraja,<sup>a</sup> C. Gopalakrishnan,<sup>c</sup> and K. Jeyadheepan<sup>d</sup>

<sup>a</sup>Department of Physics, Alagappa Chettiar Government College of Engineering and Technology, Karaikudi - 630003, India

<sup>b</sup>Department of Physics, Alagappa University, Karaikudi - 630003, India

<sup>c</sup>Nanotechnology Research Centre, SRM Institute of Science and Technology, Kattankulathur - 603203, India

<sup>d</sup>School of Electrical and Electronics Engineering, SASTRA Deemed to be University, Thanjavur - 613401, India

### ABSTRACT

In the present investigation, for the first time, we report the room temperature gas sensing characteristics of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films prepared by RF magnetron sputtering technique. The X-ray diffraction data show that the prepared Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) films are amorphous nature. The X-ray photoelectron spectroscopic study confirmed the formation of Cr<sup>3+</sup> and Cu<sup>2+</sup> states in the films. The growth conditions induce the change in morphology of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) films from cauliflower like structure to single nanoplate like structure, which may be due to the change in nucleation. The FTIR spectra of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films exhibit peaks between 431 cm<sup>-1</sup> and 774 cm<sup>-1</sup> which correspond to the characteristic stretching vibrations of Cu-O and Cr-O bonds in the films. Optical study showed the RF power induced red shift in absorption edge, which revealed the systematic reduction in optical energy band gap of the films. The activation energy ( $\Delta E$ ) of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films estimated from the Arrhenius plot are varied between 0.369 and 0.504 eV. The respective response and recovery times of Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin film sensor exposed in 25 ppm of ammonia gas are about 11 and 14 s, while that in 100 ppm, are about 51 and 53 s. The maximum sensor response of 98% was observed for 100 ppm of NH<sub>3</sub> gas at room temperature. The present report suggests that the RF magnetron sputtered Cr<sub>2</sub>O<sub>3</sub>:CuO (50:50) thin films can perform efficiently as a ammonia gas sensor at room temperature.

**Key words:** Thin films, RF sputtering, mixed metal oxides, Cr<sub>2</sub>O<sub>3</sub>, CuO, room temperature gas sensor.

\* Author for correspondence: Tel.: +91-4565-223310; Fax: +91-4565-225202; E-mail: krsivakumar1979@yahoo.com

Download English Version:

<https://daneshyari.com/en/article/11555429>

Download Persian Version:

<https://daneshyari.com/article/11555429>

[Daneshyari.com](https://daneshyari.com)