

## Accepted Manuscript

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PII: S0040-6090(17)30203-1  
DOI: doi: [10.1016/j.tsf.2017.03.028](https://doi.org/10.1016/j.tsf.2017.03.028)  
Reference: TSF 35876

To appear in: *Thin Solid Films*

Received date: 19 June 2016  
Revised date: 15 March 2017  
Accepted date: 15 March 2017

Please cite this article as: S.P. Desai, M.P. Suryawanshi, M.A. Gaikwad, A.A. Mane, J.H. Kim, A.V. Moholkar, Investigations on the thickness dependent structural, morphological, and optoelectronic properties of sprayed cadmium based transparent conducting oxide. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), doi: [10.1016/j.tsf.2017.03.028](https://doi.org/10.1016/j.tsf.2017.03.028)

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# Investigations on the Thickness Dependent Structural, Morphological, and Optoelectronic Properties of Sprayed Cadmium based Transparent Conducting Oxide

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## Abstract

The influence of thickness on the properties of cadmium oxide thin films using simple and cost-effective chemical spray pyrolysis technique is studied. The maximum film of thickness 2752 nm is achieved by tuning spraying parameters. The thickness dependent structural, morphological, and optoelectronic properties of CdO thin films have been investigated in detail. The microstructure of CdO thin films significantly changed from rough to smooth and further to rougher surface with increase in film thickness. This behavior has been further confirmed from water contact angle measurement. The optical studies show that the direct band gap energy values ranging between 2.23 to 2.46 eV. The Hall effect measurement indicates that all the films exhibit n-type semiconducting behavior with their electrical resistivity lies in the range of  $12.8 \times 10^{-4}$  to  $3.7 \times 10^{-4}$   $\Omega\text{cm}$ . The CdO film with thickness of 1371 nm exhibited the best optoelectronics properties (transmittance of 74%, figure of merit of  $18.23 \times 10^{-3} (\Omega)^{-1}$ , carrier concentration of  $7.30 \times 10^{20} /\text{cm}^3$  and mobility of  $23.11 \text{ cm}^2/\text{Vs}$ ) among all the films.

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**Keywords:** Transparent conducting oxide; Spray pyrolysis; Energy dispersive X-ray analysis; Figure of merit; Photoluminescence; Surface wettability.

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