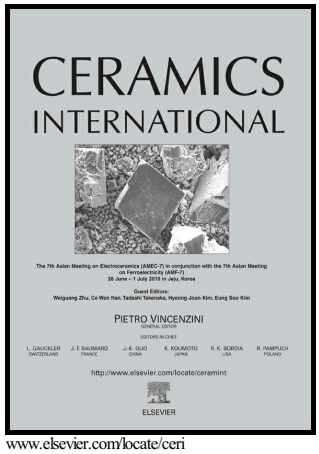

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PII: S0272-8842(18)30715-6
DOI: https://doi.org/10.1016/j.ceramint.2018.03.148
Reference: CERI17785

To appear in: *Ceramics International*

Received date: 31 January 2018
Revised date: 7 March 2018
Accepted date: 16 March 2018

Cite this article as: Saima Shaukat, M. Khaleeq-ur-Rahman, Usman Ilyas, Shahzad Naseem, I.M. Dildar, A. Latif and R.S. Rawat, Tailoring of Optical Band Gap and Electrical Conductivity in a-axis oriented Ni doped Chromium Oxide Thin Films, *Ceramics International,* https://doi.org/10.1016/j.ceramint.2018.03.148

Tailoring of Optical Band Gap and Electrical Conductivity in a-axis oriented Ni doped Chromium Oxide Thin Films

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Abstract

Ni doped Cr_2O_3 (NCO) films have attracted much attention due to their applications in the field of photovoltaics. This study reports the tailoring of structural, electrical and optical properties as a function of Ni doping in Chromium oxide (Cr_2O_3). NCO thin films were grown by Pulsed Laser Deposition (PLD) using 2nd harmonic Nd: YAG Laser on n-Si (100) with in-situ annealing of 450 °*C*. Structural analyses based on X-ray diffractometry (XRD) and Raman Spectroscopy showed the inconsistent variation in crystallinity and shift in A_{1g} band in turn revealing the successful incorporation of Ni into Chromium oxide host lattice. In addition, electrical measurements also showed an inconsistent variation in resistivity ranging from 10^2 to $10^4\ \Omega - cm$. The properties showed widening of band gap energy *(E_g)* from 3.41-3.60 eV as a function of Ni doping concentration with significantly decreased reflectance in the range of 500-600 nm thereby increasing the absorption, a pre-requisite for solar absorbers.

Keywords: Pulsed Laser Deposition; Ni Doped Chromium Oxide; Optical Band Gap; Electrical Resistivity; Photovoltaics;

1. Introduction

In the modern world, nanostructured thin films are highly attractive in the promising field of smart materials in a controlled fashion including architecture of wires, rods, or arrays that presents superior electrochemical, photovoltaic and catalytic properties due to confined thickness (at atomic scale) and large surface area to volume ratio [1]. Amongst the family of nanomaterials, especially transition metal oxides play crucial job in many fields of physics, chemistry and material science. Nanostructured metal oxides have wide band gap due to