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## Observation of room temperature ferromagnetism with giant magnetic moment based on Zn<sub>1-x</sub>Cr<sub>x</sub>O thin films grown on Si(111) substrate via 1,2-dihydroxyethane modified sol-gel dip-coating technique

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### MATERIALS LETTERS

Volume: 177 Pages: 42-45

DOI: 10.1016/j.matlet.2016.04.163

Published: AUG 15 2016

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### Abstract

Dilute magnetic semiconductors have shown a great encouragement from the technological point of view owing to their potential application in multiple spintronics, such as spin light-emitting diode, spin valve transistor, logic device, nonvolatile memory and ultrafast optical switches. Here, we report on the synthesis of Zn<sub>1-x</sub>Cr<sub>x</sub>O (0.01 ≤ x ≤ 0.09) thin films grown on Si (111) substrate via 1,2-dihydroxyethane modified sol-gel dip-coating technique for spintronic applications. The influence of partial substitution of Cr ions into the Zn sites on the chemical composition, morphology, crystal structure, and magnetic properties of the prepared films was investigated by the X-ray diffraction (XRD), atomic force microscopy (AFM), high resolution transmission electron microscopy (HR-TEM), dispersive X-ray spectroscopy (EDS), electron diffraction (SAED), X-ray electron spectroscopy (XPS) and vibrating magnetometer (VSM). A single phase and highly crystalline films are obtained. These films showed room temperature ferromagnetism at all Cr ions concentration. The Zn<sub>0.95</sub>Cr<sub>0.05</sub>O film showed a remarkable giant magnetic moment of 2.17 μ<sub>B</sub> at room temperature. This is the highest magnetic moment value ever achieved among all derived transition elements doped ZnO based dilute magnetic semiconductors till the date. (C) 2016 Elsevier B.V. All rights reserved.

### Keywords

**Author Keywords:** Crystal structure; Nano compo sites; Magnetic materials; XPS; AFM; ZnO

**KeyWords Plus:** DOPED ZNO; OXIDE; SPINTRONICS; LAAL03

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### Funding

Funding Agency	Grant Number
Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah	130-079-D1435
DSR	

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### Publisher

ELSEVIER SCIENCE BV, PO BOX 211, 1000 AE AMSTERDAM, NETHERLANDS

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