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# Synthesis and properties of Ag-doped ZnO films with room temperature ferromagnetism

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**Abstract:** A series of Ag-doped ZnO films were prepared by DC magnetron sputtering. XRD and SEM results showed that the doping amount of Ag had a great influence on the films' morphology and ferromagnetism, and their magnetism can be improved by doping an appropriate amount of Ag. The theoretical analysis suggested that the magnetism resulted mainly from the film grain boundary surfaces. Further research revealed that these films had strong timeliness. Such a result indicated that the room temperature ferromagnetism of Ag-doped ZnO films did not stem from the cation vacancies but from the oxygen vacancies on the boundary surfaces.

**Keywords:** ZnO film; Magnetron sputtering; Room temperature ferromagnetism

## 1. Introduction

In recent years, diluted magnetic semiconductor materials have received much attention owing to their extensive potential applications in solar cells, piezoelectric films, optical devices and so on[1-3]. Among them, considerable efforts have been made to study ZnO semiconductor material[4-5]. In 2000, Dietl et al.[6] completed the theoretical calculation for Mn-doped ZnO diluted magnetic semiconductor using Zener model, and predicted that such wide band gap ZnO-based diluted magnetic semiconductors would obtain room temperature ferromagnetism(RTFM). Shortly afterward, an upsurge has been triggered in research on ZnO-based diluted magnetic semiconductors. Many teams carried out researching on transition element-doped ZnO semiconductor materials and found that these materials had obvious room temperature

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