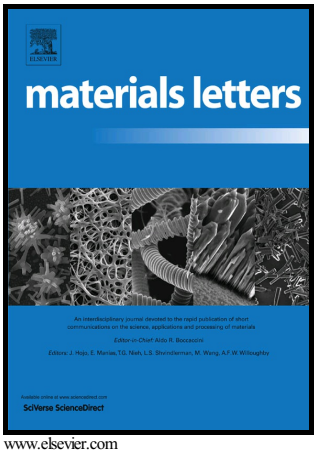

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The structure, optical and magnetic properties of arsenic implanted ZnO films prepared by molecular beam epitaxy

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Abstract

Different concentrations of arsenic ions have been introduced into high quality O polar ZnO films prepared by rf-plasma assisted molecular beam epitaxy on sapphire substrates by ion implantation. Rutherford Backscattering/Channeling, x-ray diffraction, Raman spectroscopy and optical absorption measurements have been carried out to characterize the implantation induced disorder in the ZnO films. Room temperature ferromagnetism has been observed for the films implanted with As dose higher than 6×10^{18} cm^{-3}. The size of the observed moment is too large to be attributed to the As related defect complex (As_{Zn}-$2V_{Zn}$) and is attributed to defects introduced by the ion implantation process. This was confirmed by the observation that the magnetization could be removed by annealing the films.

Keywords: Semiconductors; Thin films RT; Ferromagnetism; Ion implantation

1. Introduction

ZnO based diluted magnetic semiconductors are considered to be promising materials for potential application in spintronic device [1]. Many authors report that the inclusion of magnetic ions in ZnO leads to ferromagnetism above room temperature (RT) [2,3], however the origin of the magnetism remains controversial. It has been found that defects play an important role in establishing the long-range