

Zn_{0.9}Mg_{0.1}O:Ga 宽带隙导电膜的 PLD 制备及性能研究

陈志强, 方国家, 李春, 盛苏, 赵兴中

武汉大学物理科学与技术学院、纳米科技中心, 武汉 430072

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摘要 利用脉冲激光沉积法(PLD)制备了Ga掺杂的Zn_{0.9}Mg_{0.1}O(ZMO:Ga)宽带隙透明导电薄膜.

采用各种分析手段研究了沉积温度和真空退火处理对薄膜结构、表面形貌及光电性能的影响. 结果表明, 制备的薄膜具有ZnO(002)择优取向; 200℃下沉积的薄膜通过3×10⁻³Pa的真空400℃退火2h后,

其电阻率由8.12×10⁻⁴Ω·cm减小到4.74×10⁻⁴Ω·cm, 禁带宽度则由原来的3.83eV增加到3.90eV.

退火处理增强了薄膜的择优取向和结晶度、增加了禁带宽度、提高了载流子浓度并使其透射谱线的光学吸收边发生蓝移现象.

关键词 [ZnMgO:Ga膜](#) [脉冲激光沉积](#) [沉积温度](#) [真空退火](#)

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Fabrication and Properties of Pulsed Laser Deposited Wide Band-gap Zn_{0.9}Mg_{0.1}O:Ga Conducting Films

CHEN Zhi-Qiang, FANG Guo-Jia, LI Chun, SHENG Su, ZHAO Xing-Zhong

Department of Physics and Center of Nanoscience & Nanotechnology Research, Wuhan University, Wuhan 430072, China

Abstract Wide band gap and highly transparent conductive Ga-doped Zn_{0.9}Mg_{0.1}O (ZMO:Ga) thin films were deposited on glass substrates by pulsed laser deposition (PLD) technique. The properties of the films were characterized through hall effect, double beam spectrophotometer, atomic force microscope (AFM) and X-ray diffraction (XRD). The effects of substrate temperature and post deposition vacuum annealing on structural, electrical and optical properties of ZMO:Ga thin films were investigated. The experimental results show that the electrical resistivity of the film deposited at 200℃ is 8.12×10⁻⁴Ω·cm, and can be further decreased to 4.74×10⁻⁴Ω·cm with post annealing at 400℃ for 2h under 3×10⁻³Pa. In the meantime, its band gap energy can be increased to 3.90eV from 3.83eV. The annealing process leads to the improvement of (002) orientation, wider band gap, increased carrier concentration and blue shift of absorption edge in the transmission spectra of ZMO:Ga thin films.

Key words [ZnMgO:Ga films](#) [pulsed laser deposition \(PLD\)](#) [substrate temperature](#) [vacuum annealing](#)

DOI:

通讯作者 方国家 gjfang@whu.edu.cn

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