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溅射气压对ZnO透明导电薄膜光电性能的影响

周继承, 李 莉

(中南大学 物理科学与技术学院, 长沙 410083)

摘要: 采用射频磁控溅射方法, 在普通玻璃上制备了具有高度 c 轴取向的ZnO薄膜, 研究了溅射气压(0.2~1.5 Pa)对ZnO薄膜的微观结构和光电性能的影响。AFM、XRD、UV-Vis分光光度计及四探针法研究表明: 随着溅射气压的增大, ZnO薄膜沿 c 轴方向的结晶质量提高, 晶粒细化, 薄膜表面更加致密, 晶粒大小更加均匀; ZnO薄膜在400~900nm范围内的平均透过率均高于85%, 其中在0.5~1.5 Pa范围内其透过率高于90%; 样品在高纯氮气气氛中经350 °C, 300 s退火后, 电阻率最低达到 10^{-2} Ω·cm量级。

关键字: 射频磁控溅射; ZnO薄膜; 溅射气压; 透明导电薄膜

Effects of sputtering pressure on electrical and optical properties of transparent conducting ZnO thin film

ZHOU Ji-cheng, LI Li

(School of Physics Science and Technology, Central South University, Changsha 410083, China)

Abstract: ZnO thin films were deposited on glass substrate using the reactive radio-frequency (RF) magnetron sputtering method. The influences of pressure on the surface morphology, the electrical and optical properties were studied by AFM, XRD, UV-Vis spectrophotometer and four-probe method. The experimental results indicate that the crystalline quality of ZnO thin film is improved and the thin film shows higher c -axis orientation with increasing the pressure. The average transparency of ZnO thin films is higher than 85% in the range of 400~900 nm under different pressures, and the average transparency is higher than 90% at the pressure between 0.5~1.5 Pa. After annealing at 350 °C for 300 s under N₂ ambient, the lowest resistivity is 10^{-2} Ω·cm.

Key words: radio-frequency magnetron sputtering; ZnO thin film; sputtering pressure; transparent conducting thin film

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地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-88876765, 88877197, 88830410 传真： 0731-88877197

电子邮箱： f-ysxb@mail.csu.edu.cn