Effect of Pressure and Temperature on Al-doped Zinc Oxide Thin Films Deposited by Radio Frequency Magnetron Sputtering

Junyoung Kang¹, Hyeongsik Park¹ and Junsin Yi¹ *

¹School of Electronic Electrical Engineering, College of Information and Communication Engineering, Sungkyunkwan University, Suwon, 440-746, Korea

In this paper, we report electrical, optical and structural properties of Al-doped zinc oxide (AZO) thin films deposited at different substrate temperatures and pressures. The films were prepared by radio frequency (RF) magnetron sputtering on glass substrates in argon (Ar) ambient. The X-ray diffraction analysis showed that the AZO films deposited at room temperature (RT) and 20 Pa were mostly oriented along a-axis with preferred orientation along (100) direction. There was an improvement in resistivity (3.7x10⁻³ Ω·cm) transmittance (95%) at constant substrate temperature (RT) and working pressure (20 Pa) using the Hall-effect measurement system and UV-vis spectroscopy, respectively. Our results have promising applications in low-cost transparent electronics, such as the thin-film solar cells and thin-film transistors due to favourable deposition conditions. Furthermore our film deposition method offers a procedure for preparing highly oriented (100) AZO films.

Keywords: AZO, RF-magnetron sputtering, XRD

Fig. 1. XRD patterns of AZO films deposited at various pressures and RT.

Table I. The FWHM and Grain size as a function of the pressure variation from 0.13 Pa to 20 Pa.