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Chien-Yie Tsay, Kun-Che Pai

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Properties of Al-Ga co-doped ZnO semiconductor thin films deposited on polyethylene terephthalate substrates by radio frequency magnetron sputtering

Chien-Yie Tsay* and Kun-Che Pai

Department of Materials Science and Engineering, Feng Chia University, Taichung 40724, Taiwan

Abstract

Al and Ga co-doped ZnO (AGZO) semiconductor thin films were deposited on polyethylene terephthalate (PET) substrates by radio frequency magnetron sputtering. Prior to oxide thin film deposition, the hydrophilicity of the surface of the PET substrate was increased by corona discharge treatment. In this study, the influence of corona discharge power on the surface properties of the PET substrates and the effect of substrate temperature on the physical properties of PET/AGZO thin film samples were investigated. After corona discharge treatment to modify the surfaces of the PET substrates, drastic decreases in the contact angle of water on the PET substrates demonstrated that the corona discharge treatment changed the surface wettability of the PET substrates. Experimental results showed that increasing the substrate temperature from room temperature to 135 ºC significantly enhanced the crystallinity, reduced the surface roughness, and improved the electrical properties of the AGZO thin films. The AGZO thin films deposited on PET substrates at 135 ºC had the highest Hall mobility of 5.5 cm^2/Vs.

Keywords: Oxide semiconductor; AGZO thin film; RF magnetron sputtering; flexible substrate; electrical properties

*Corresponding author. Tel: +886-4-24517250 ext.5312; Fax.:+886-4-24510014.

E-mail address: cytsay@fcu.edu.tw (C.-Y. Tsay)