T1-P019

Electrical and Optical Properties of P-type Amorphous Oxide Semiconductor Mg:$ZnCo_2O_4$ Thin-Film

Chil-Hyoung Lee[1,2], Won-Kook Choi[1], Jeon-Kook Lee[1], Doo-Jin Choi[2], Young-Jei Oh[1†]

[1]Opto-electronic Materials Center, Korea Institute of Science and Technology,
[2]Department of Advanced Materials Engineering, Yonsei University

Oxide semiconductors are attractive materials for thin-film electronics and optoelectronics due to compatibility with synthesis on large-area, glass and flexible substrate. However, development of thin-film electronics has been hampered by the limited number of semiconducting oxides that are p-type. We report on the effect of the oxygen partial pressure ratio in the gas mixture on the electrical and optical properties of spinel Mg:$ZnCo_2O_4$ thin films deposited at room temperature using RF sputtering, that exhibit p-type conduction. The thin-films are deposited at room temperature in a background of oxygen using a polycrystalline Mg:$ZnCo_2O_4$ ablation target. The p-type conduction is confirmed by positive Seebeck coefficient and positive Hall coefficient. The electrical resistivity and carrier concentration in on dependent Mg:$ZnCo_2O_4$ thin films were found to be dependent on the oxygen partial pressure ratio. As a result, it is revealed that the Mg:$ZnCo_2O_4$ thin-films were greatly influenced on the electrical and optical properties by the oxygen partial pressure condition. The visible region of the spectrum of 36～85%, and hole mobility of 1.1～3.7 cm^2/Vs, were obtained.

Keywords: Spinel oxide, Mg:$ZnCo_2O_4$, Electrical property, P-type amorphous oxide semiconductor