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The Properties of Boron-doped Zinc Oxide Film Deposited according to Oxygen Flow Rate

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The application of BZO (Boron-doped Zinc Oxide) films use as the TCO(Transparent Conductive Oxide) material for display and solar cell industries, where the conductivity of the BZO films plays a critical role for improvement of cell performance. Thin BZO films are deposited on glass substrates by using RF sputter system. Then charging flow rates of O2 gas from zero to 10 sccm, thereby controlling the impurity concentration of BZO. BZO deposited on soda lime glass and RF power was 300 W, frequency was 13.56 MHz, and working pressure was 5.0 x 10-6 Torr. The Substrate and glass between distance 200 mm. We measured resistivity, conductivity, mobility by hall measurement system. Optical properties measured by photo voltaic device analysis system. We measured surface build according to oxygen flow rate from XPS (X-ray Photoelectron Spectroscopy) system. The profile of the energy distribution of the electrons emitted from BZO films by the Auger neutralization is measured and rescaled so that Auger self-convolution arises, revealing the detail structure of the valence band. It may be observed coefficient γ of the secondary electron emission from BZO by using γ -FIB (Gamma-Focused Ion Beam) system. We observed the change in electrical conductivity by correlation of the valence band structure. Therefore one of the key issues in BZO films may be the valence band that detail structure dominates performance of solar cell devices. Demonstrating the secondary electron emission by the Auger neutralization of ions is useful for the determination of the characteristics of BZO films for solar cell and display developments.

Keywords: TCO, BZO, oxygen flow rate, solar cell, thin film