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Post-annealing effects on the properties of ZnO thin films for Film Bulk Acoustic Resonator

Sun Wook Kim, Sun Yung Kim, Soo Gil Kim, Jung Hyuk Koh*, Neung Heon Lee,
Young Hwa Shin

Department of Electronic Engineering, Kyungwon University, *Korea Electrotechnology Research
Institute

In this study post-annealing effects on ZnO thin films made by rf-magnetron sputtering technique on Al bottom electrode deposited were reported. Al bottom electrode was evaporated on the solidly mounted structure of SiO₂/W/SiO₂/W/SiO₂ on the Si substrate. 1.6 μm-thick ZnO thin films were prepared by rf-sputtering methods at the room temperature. Stoichiometric ZnO compound target was sputtered in O₂-Ar(1:1) atmosphere with various working pressures in a range of 3~25 mTorr. Film thickness was measured by surface profiler. Post-annealing effects on rf-sputtered ZnO thin film were investigated by employing X-ray diffractometer, SEM, and *I*(current)-*V*(voltage) characteristics. From the XRD θ - 2θ scan, we found that the highest intensities of (002) oriented ZnO films were measured at working pressure of 15 mTorr with O₂-Ar(1:1). ZnO thin films were annealed in a furnace from 100 to 500 °C for 30min after the deposition. ZnO films through the post annealing process exhibited an improved (002) preferential c-axis orientation and narrower FWHM (full width at the half maximum) values. Current-voltage measurements were also performed to investigate post-annealing effects.

We confirmed that the post-annealing process could improve crystallographic and electrical properties even though ZnO thin films were deposited at room temperature.