

Effects of carrier concentration in the active channel layer on electrical characteristics of ZnO-based TFTs

Yeon-Keon Moon, Dae-Yong Moon, Sang-Ho Lee, and Wan-Jong Park

Department of Materials Science and Engineering, Hanyang University, Seoul 133-791, Korea

We report the fabrication and characteristics of thin film transistors with ZnO channel layers (ZnO-TFTs) having different carrier concentrations. Also, we define the operation mechanism of ZnO-TFTs as the variation of carrier concentration of the ZnO channel layer. The ZnO thin films were deposited on SiO₂/p-Si substrate by DC magnetron sputtering at various oxygen partial pressures. Effects of carrier concentration of ZnO thin films on the electrical performance of ZnO-TFTs with bottom gate structure were investigated. The ZnO thin films deposited at O₂ partial pressures of 40 % exhibit a non-stoichiometric system in an oxygen rich state, resulting in carrier concentrations as low as $\sim 10^{12} \text{ cm}^{-3}$. Our research implied that an attractive application for TFTs involves their use as select-transistors in individual pixels of an active-matrix liquid-crystal display.