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Fabrication and characterization of ZnO based thin film transistors

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ZnO, a well-known transparent semiconductor, has drawn much interest as a potential material for applications in TFTs because of its relatively very large field effect mobility over conventional Si-TFTs, wide band gap, mechanically robust, more pixels, better gradient, non-toxicity, and easy wet chemical etching process. In this study, we report on the fabrication and characterization of the TFTs using ZnO as an active channel layer grown by radio frequency (rf) magnetron sputtering method. The TFT structure used in this study was a bottom gate type, which consists of SiN_x as a gate insulator and indium tin oxide (ITO) as a gate deposited onto glass substrates (Corning glass). These TFTs had field effect mobility of 3.683 cm²/V.s, a drain current on to off ratio of greater than 10⁶, the off current of less than 10⁻¹² A and a threshold voltage of 5 V at a maximum device processing temperature of 350°C. This TFT had a channel width of 200 μm and channel length of 30 μm. Improvement of electrical characteristics can be achieved for realization of TFTs based on ZnO thin films.