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Pin diodes based on n-ZnO/i-Al_2O_3/p-Si Y.S WANG, Q.Y. CHEN, W.Y. LIN, C.F. CHANG, W.C. HSIEH, H.C. HUANG, L.W. TU, National Sun Yat-Sen University, P.V. WADEKAR, W.K. CHU, University of Houston, H.H. LIAO, Enli Technology Inc., C.H. LIAO, ROC Military Academy — We focus on the pin-diodes fabricated with n-type ZnO thin films deposited on p-type silicon by RF-sputtering, using very-thin Al_2O_3 as an insulation layer. By annealing at various temperatures, the domain sizes of the ZnO films would vary accordingly as viewed under scanning electron microscope (SEM). With larger grains, the leakage current was lowered, suggesting that grain boundaries are responsible for the leakage. However, the ZnO films largely remain textured along the c-axis as judged by their clear ZnO (0002) peaks of the XRD theta-2theta scans that are related to the phi-scans of off-axis planes. Furthermore, the XRD data also showed the structural changes of the insulation layer after annealing above certain temperature. For the samples annealed at 750°C and 850°C, the I-V curves showed characteristic pin diodes behaviors. The photoconductivity was measured as a function of intensity of a pulsed laser beam of wavelengths 1064nm, 532nm, 266nm. The photoelectronic IV responses will be discussed in regards to the electronic tunneling structures of the pin junctions and their dependence on the fabrication processes.

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