Abstract Submitted
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Design and characterization of transparent thin film nanostructure device UDAY TRIVEDI, UTPAL JOSHI — Indium tin oxide (ITO) is one of the most widely used transparent conducting oxides (TCO) because of its electrical conductivity and optical transparency.We have grown "all oxide" transparent $p-n$ junction thin film nanostructure device by using chemical solution deposition and e-beam evaporation onto SiO_2 substrate. The oxide $p-n$ junction was characterized by GIXRD, AFM, UV-Vis. spectroscopy and I-V measurements. Combined GIXRD and AFM confirm phase pure, mono-disperse 30 nm NiO and ITO nanocrystallites. More than 70% optical transparency is achieved across 160 nm thick $p-n$ junction. The forward bias current is greater than the reverse bias current by approximately a factor of 10^4 in the measured voltage s weeping range. A small leakage current as low as 12 nA was observed at a reverse bias of –5 V. Previously, Tonooka and co-authors [3] reported the average turn on voltage of their n-ZnO / p-Cu-Al-O diode $\sim$ 0.5 V, which is higher than our p-NiO/n-ITO diode. This is mainly because of the large variations in the carrier concentrations as well as larger lattice mismatch between the oxides forming the $p-n$ junction. The observed optical and electrical properties of oxide transparent diode are attributed to the heteroepitaxial nature and carrier diffusion at the junction interface.

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