The Role of Ultra Thin High Conductivity InSnZrO Inserted Layer on the Mobility and Stability Improvement of Amorphous InSnZnO Thin Film Transistors

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High mobility InSnZnO thin film transistors have been achieved by inserting ultra thin ITO:Zr layers at the gate insulator/active layer interface. The conductivity as well as thickness of ITO:Zr layers were investigated to figure out the best condition for devices fabrication. The optimized device with ITO:Zr layer at the thickness of 5nm and concentration of 10^{19} cm^{-3} shows a high saturation mobility of ~75 $cm^2V^{-1}s^{-1}$ with threshold voltage of 1.2 V. The highest mobility was obtained for the sample at the concentration of 10^{20} cm^{-3} (~200 $cm^2V^{-1}s^{-1}$) however the threshold voltage shift to negative side due to the excess carrier concentration at the interface of active and insulator. Positive and negative bias stress studies indicate that the presence of ITO:Zr acted as a hole filter layer. The introduction of ITO:Zr layer into the interface of active/insulator leads to the threshold voltage shift under gate bias decrease from 6 to 0.5 V and from -7.5 to -1.5 V for positive and negative bias, respectively. This improvement can be attributed to a decrease in the interface trap density for the ITO:Zr inserted ITZO device.

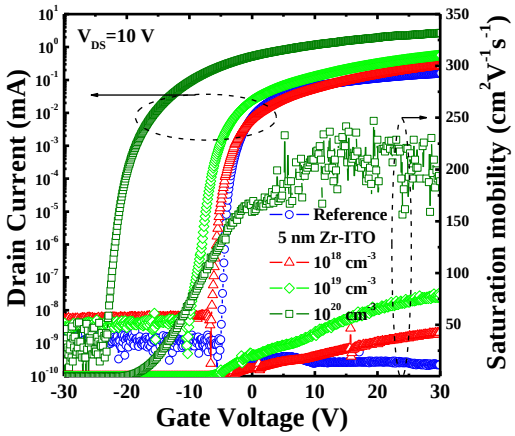

Fig. 1. Transfer characteristics of devices at various ITO:Zr inserted layer carrier concentrations level

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