Flexible a-IGZO TFT Properties Changed Under Increased Mechanical Stress

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Flexible back-plane device have been recently attracted in the next generation display due to their several advantage such as thin, light and flexibility of panel design compared to conventional glass-based panel [1]. Although the shape of glass-based panels were fixed on the operating display mode, however, the flexible-based panels must need to consider about mechanical stress due to the change of electrical properties under external mechanical stresses. As previous report of flexible a-IGZO, the mechanical stress could also affect to the device performance as well as bias, thermal and illumination stress [2].

In this work, the device performance of conventional a-IGZO TFTs fabricated on the flexible substrate was investigated with respect to different mechanical stresses. The adopted structure of device was top gate/bottom contact and conventional buffer stacked polyimide (PI) film was used as substrate. By using the wet etching process of photolithography, a-IGZO TFTs were patterened and total maximum temperature was 250°C in process of sample preparation. In order to evaluate effects of mechanical stress, various bending radius (R=∞, 10mm, 5mm and 2mm) were applied on the substrates. The TFT parameters and NBTS (negative bias temperature stress, V_G = -20V & temperature = 60℃) instability were systemically analyzed as a function of mechanical bending radius. The density of states (DOS) and contact resistance was investigated to understand origin of degradations of electrical device performance.

As mechanical stress increased, TFT instability also degraded (Vth shift R =∞: -0.58V to R = 5mm: -6.42V). It maybe mechanical stress also affects like other stresses, that stress will be main factor of flexible display evaluation.

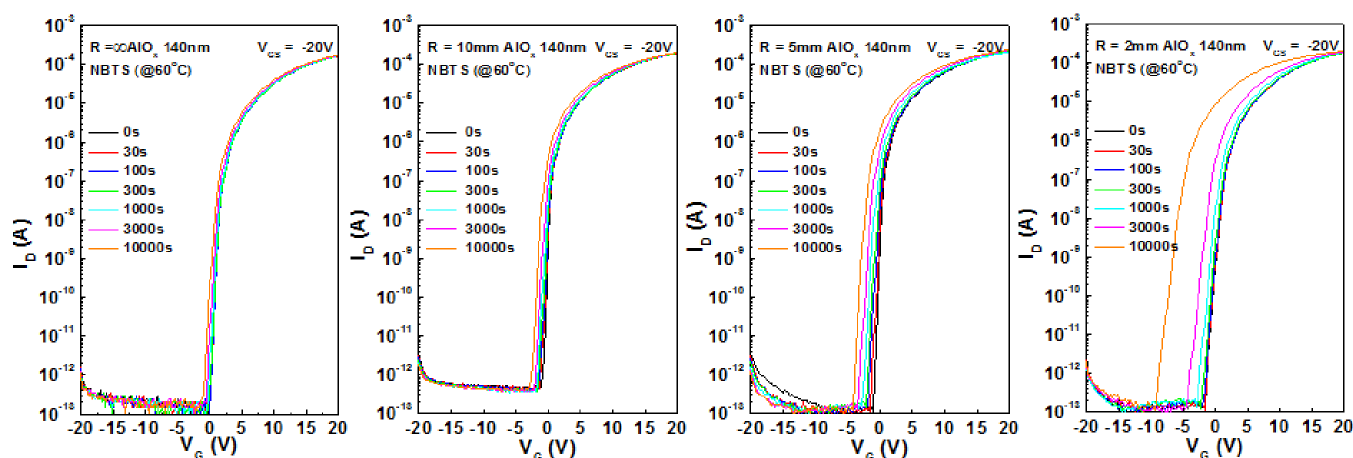

Fig. 1. Negative bias temperature stress curves (Stress time: 10,000s @ V_G=-20V & Temperature =60°C) with different bending radius.

Acknowledgment

References

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