The low temperature oxide TFT backplanes for flexible display

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Upto now, the commercially available flexible display devices have been made using coated PI substrate with same process temperature for glass substrate. However, due to the cost and the complexity of lift-off process for using coated PI substrate, the direct fabrication of TFT backplane on plastic substrate will be the final goal in the flexible display technology. And it can be applied to R-2-R processes.

The fabrication processes for oxide TFTs have good adaptibility for various process condition, but the recipe for each process should be cafefully designed. The deposition condition for oxide semiconductor layer and gate dielectric layer were optimized to obtain high mobility oxide TFT on plastic substrate.

High mobility InZnO TFTs were fabricated on PEN substrate. PEALD deposited SiO2 layer was used for protection layer and 1st gate insulator. ALD Al2O3 layer was applied as 2nd (main) gate insulator. In general it is not easy to obtain good quality insulator at low temperature. PEALD method provides good quality SiO2 layer at 250℃. [1] The deposition conditions of rf-sputtered InZnO layer, such as O2 partial pressure, were also optimized in order to obtain high mobility TFT at low temperature. All the fabrication processes of InZnO TFTs were conducted under 200℃, which is the maximum temperature for adhesive material located between carrier glass and PEN substrate. The InZnO TFTs were annealed at 250℃ before measurements. The field-effect mobility, turn-on voltage, and subthreshold swing of fabricated InZnO TFTs were 32.5cm2/Vs, -1.75V, and 0.23V/dec, respectively. The hysteresis voltage of the transfer characteristics is as small as 0.5V.

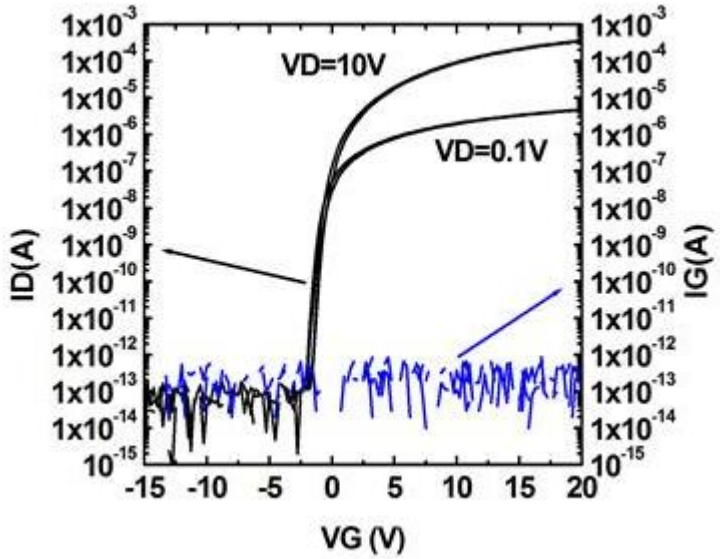

Fig. 1. High mobility IZO TFT on PEN substrate

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References

1. J.-B. Ko, I.-Y. Eom, C.-S. Hwang, S. Cho, M. Ryu, H.-I. Yeom, H. Moon and S.-H. Ko Park, *IMID'14 Technical Digest*, p. 141 (2014).