Inkjet Printed Metal Oxide Thin Film Transistors

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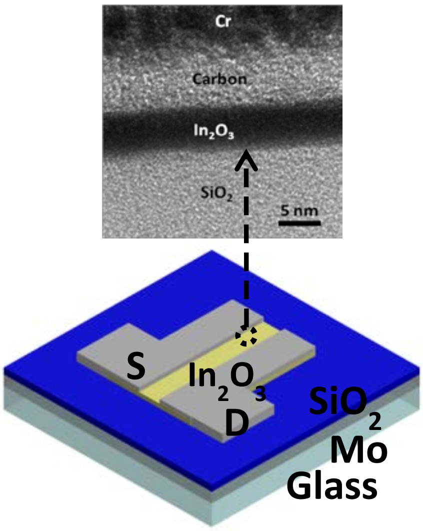
Compared to conventional amorphous silicon (a-Si) TFTs, amorphous metal oxide TFTs have superior device performance such as higher mobility, better sub-threshold swing, and lower off-state current. Amorphous metal oxide TFTs have an additional advantage on the device uniformity due to the lacks of grain boundary issues in the poly-Si TFTs. Compared with sputtered oxide TFTs, metal oxide TFTs with solution processes have better flexibility and controllability to adjust the composition of chemical solution. Among various solution-based approaches, direct printing is a promising low-cost technique in fabricating TFTs. The printing technique offers several advantages in manufacturing electronics such as a direct writing of materials, reduction of chemical waste, and reproducibility with high-resolution scale, which are not affordable from other solution-based approaches. While many printed OTFTs have been reported, relatively fewer studies, associated with printed metal oxide TFTs, have been pursued. Interests to printed metal oxide TFTs have grown continuously since the first report of a general route towards printed oxide TFTs[1]. A variety of metal oxide materials have been reported as the channel layer of printed metal oxide TFTs[2]. In this report, the development of printed metal oxide TFTs will be discussed including the ink formulations, the types and characteristics of the applied printers, and fabricated thin film transistor characteristics. Lastly the report will be concluded with a concise summary and future outlook from an industry perspective.



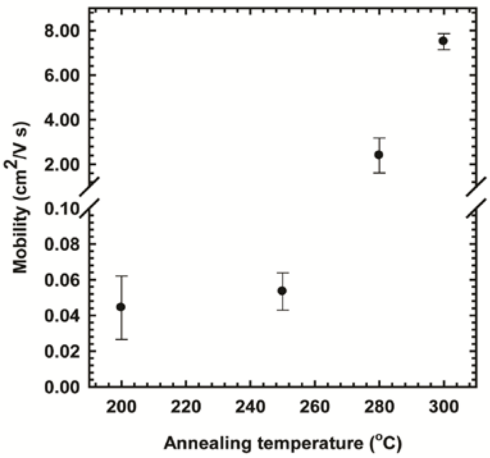


Fig. 1. Scheme of In2O3 TFTs and HRTEM image of In2O3 layer (left) and summary of device performances at different process temperatures (right).

Acknowledgment

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References

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