DEVELOPMENT OF HIGH PERFORMANCE METAL OXIDE THIN-FILM TRANSISTORS FOR OLED AND FLEXIBLE DISPLAY

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ZnO based oxide semiconductors have attracted tremendous attention as a channel layer of pixel switching transistors in the LCD, OLED and flexible displays because they offer intriguing properties such as high mobility, extremely low leakage current and low cost fabrication cost compared to silicon based semiconductor. Since implementation of IGZO transistor into commercial high end LCD and large area OLED TV in 2012, the required carrier mobility of metal oxide thin-film transistors (TFTs) has been increasing rapidly to meet the demands of the ultra-high-resolution, large panel size and three dimensional visual effects as a megatrend of flat panel display.[1-2] However, the typical field-effect mobility of IGZO TFTs in the practical production line is less than 15 cm²/Vs, which is still not enough to drive the high-end flat panel displays with ≥ 300 ppi, more than 60 inch and high frame rate (≥ 240 Hz).[3] Approaches to improve the mobility of electron carriers in metal oxide TFT would involve the optimization of cation composition, stacked channel structure and the lattice ordering-induced crystallization.[4] In this presentation, we presented our recent efforts toward the high performance and good reliability, which included the double channel structure such as ZTO/IZO and ZTO/ITO, the metal-induced crystallization at a low temperature, and atomic layer deposited IGZO TFTs.

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References