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High-performance thin-film transistor with a novel metal oxide channel layer

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Transparent semiconductor oxide thin films have been attracting considerable attention as potential channel layers in thin film transistors (TFTs) owing to their several advantageous electrical and optical characteristics such as high mobility, high stability, and transparency. TFTs with ZnO or similar metal oxide semiconductor thin films as the active layer have already been developed for use in active matrix organic light emitting diode (AMOLED). Of late, there have been several reports on TFTs fabricated with InZnO, AlZnSnO, InGaZnO, or other metal oxide semiconductor thin films as the active channel layer. These newly developed TFTs were expected to have better electrical characteristics than ZnO TFTs. In fact, results of these investigations have shown that TFTs with the new multi-component material have excellent electrical properties.

In this work, we present TFTs with inverted coplanar geometry and with a novel HfInZnO active layer co-sputtered at room temperature. These TFTs are meant for use in low voltage, battery-operated mobile and flexible devices. Overall, the TFTs showed good performance: the low sub-threshold swing was low and the $I_{on/off}$ ratio was high.