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# Solution-processed ytterbium oxide dielectrics for low-voltage thin-film transistors and inverters

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## Abstract

High permittivity (high k) metal-oxide thin films fabricated via solution processes have recently received much attention for the construction of low-operating voltage and high-performance thin-film transistors (TFTs). In this report, amorphous ytterbium oxide ( $\text{Yb}_2\text{O}_3$ ) thin films were fabricated by spin coating and their applications in TFTs were explored. The physical properties of the solution-processed  $\text{Yb}_2\text{O}_3$  thin films processed at different annealing temperatures were systematically investigated using various characterization techniques. To explore the feasibility of the  $\text{Yb}_2\text{O}_3$  thin films as gate dielectrics for oxide TFTs,  $\text{In}_2\text{O}_3$  TFTs based on  $\text{Yb}_2\text{O}_3$  dielectrics were integrated. All the devices could be operated at 3 V, which is critical for the applications in portable, battery-driven, and low-power electronic devices. The optimized  $\text{In}_2\text{O}_3/\text{Yb}_2\text{O}_3$  TFT exhibits high electrical performances, including field-effect mobility of  $4.98 \text{ cm}^2/\text{Vs}$ , on/off current ratio of  $\sim 10^6$ , turn-on voltage around 0 V, and subthreshold swing of 70 mV/decade, respectively. To demonstrate the potential of  $\text{In}_2\text{O}_3/\text{Yb}_2\text{O}_3$  TFT toward more complex logic application, the unipolar inverter was further constructed.

Keywords: solution process; high-k dielectric; low-voltage operation; thin-film transistor; inverter

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