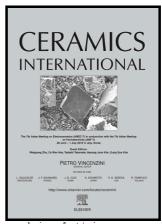
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Solution-processed ytterbium oxide dielectrics for low-voltage thin-film transistors and inverters

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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 (Yb₂O₃) thin films were fabricated by spin coating and their applications in TFTs were explored. The physical properties of the solution-processed Yb₂O₃ thin films processed at different annealing temperatures were systematically investigated using various characterization techniques. To explore the feasibility of the Yb₂O₃ thin films as gate dielectrics for oxide TFTs, In₂O₃ TFTs based on Yb₂O₃ 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 In₂O₃/Yb₂O₃ TFT exhibits high electrical performances, including field-effect mobility of 4.98 cm²/Vs, on/off current ratio of ~10⁶, turn-on voltage around 0 V, and subthreshold swing of 70 mV/decade, respectively. To demonstrate the potential of In₂O₃/Yb₂O₃ 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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