Low Driving Voltage Amorphous In-Ga-Zn-O Thin Film Transistors with Small Subthreshold Swing Using High-κ Hf-Si-O Dielectrics

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Abstract

Low driving voltage thin-film transistors (TFTs) were fabricated by integrating both a sputtered high-κ Hf－Si－O gate dielectric and an amorphous In－Ga－Zn－O active layer on a silicon substrate. The influence of postdeposition annealing (PDA) temperature for the Hf－Si－O gate dielectric on device performance was investigated. The 400 °C PDA Hf－Si－O/a-In－Ga－Zn－O TFT exhibits a low threshold voltage of 0.005 V, a small subthreshold swing (SS) of 0.11 V·dec-1, a high saturation mobility of 12.7 cm2·V-1·s-1, and an acceptable current ratio of 3×105. The low threshold voltage and small SS are attributed to the excellent gate control ability which allows the device to operate at 2.0 V for low power applications. ©2010 The Japan Society of Applied Physics

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