

The composite dielectric materials toward low operating voltage OTFTs

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In this study, we have introduced the TiO₂-polymer composite (TPC) dielectric, which is composed of a TiO₂ precursor (titanium (IV) butoxide and acetyl acetone) and poly(4-vinylphenol) (PVP) solution (PVP, poly(melamine-co-formaldehyde) methylated/butylated and propylene glycol methyl ether acetate (PGMEA) solvent), to overcome the problems discussed above. This TPC dielectric can easily be used in solution processes, such as spin casting and showed good stability in ambient conditions, air environments and moisture conditions. The TPC thin film as a dielectric layer could sufficiently hinder leakage currents and successfully operate in low-voltage conditions, such as -3V. Furthermore, the TPC dielectric layer exhibited enhanced performance characteristics, such as on/off ratio, mobility, and subthreshold swing, compared with the general polymer dielectric. Although this device showed a low mobility value because of intrinsic organic semiconductor limitation, it operated well at a low voltage bias with the considerable and remarkable performance. We conclude that the TPC dielectric, TiO₂-polymer composite dielectric, is quite promising as a dielectric layer in advanced flexible OTFTs.