A novel method for fabrication of polymer gate dielectric via solvent-free initiated chemical vapor deposition (iCVD)

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As the request for large-area electronics on flexible substrate glows rapidly, research on solution-processable organic thin film transistors (oTFTs) has been increased in the past decade. However, a high operating voltage is usually required for most oTFTs. To produce low-voltage operating oTFTs, there have been many attempts to obtain a high capacitance by reducing the thickness of gate dielectrics. However, most of solution-based processes for organic electronics usually require thick polymer film to prevent the leakage current due to the pinhole problem. Moreover, the presence of impurities may occur in the solution processes. To overcome this problem, iCVD (initiated chemical vapor deposition) will be introduced. iCVD is a powerful method for depositing pinhole-free, conformal and ultrathin polymeric film. Herein, we report a new ultra-thin polymer gate dielectric for organic thin film transistor. The materials we introduce is poly(perfluorodecyl acrylate) (p(PFDA)), the hydrophobic polymer. It shows very low level of leakage current level under 10-8A/cm2, low hysteresis and on-off ratio over 105.