

Synthesis of ultrathin, homogeneous copolymer dielectrics for controlling threshold voltage of organic transistors without degrading the carrier mobility

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In OTFTs, the threshold voltage ( $V_T$ ) is one of the most crucial device parameters as well as mobility. For the power consumption and circuit performance of the OTFTs, it is necessary to secure an independent tunability of the  $V_T$ . This work proposes that it is possible to control OTFT  $V_T$  by using new copolymer dielectrics. A series of new ultrathin copolymer dielectrics (sub-23nm) with different compositions are synthesized via initiated chemical vapor deposition (iCVD) to introduce electropositive functional group into the dielectrics, leading to the negative  $V_T$  shift of n-type OTFTs. By combining the copolymer dielectrics with an interfacial layer for good interfacial match with semiconductor, the  $V_T$  of OTFT can be independently controlled according to the copolymer composition without any degradation of device performance. The independent controllability of  $V_T$  without degrading other parameter will be highly beneficial for engineering the OTFT performances as desired values.