# Design of Polymer-Carbon Nanohybrid Junction by Interface Modeling for Efficient Printed Transistors

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Molecularly hybridized materials composed of polymer semiconductors (PSCs) and single-walled carbon nanotubes (SWNTs) may provide a new way to exploit an advantageous combination of semiconductors, which yields electrical properties that are not available in a single component system. We demonstrate for the first time high-performance ink-jet printed hybrid thin film transistors with an electrically engineered heterostructure by using specially designed PSCs and semiconducting SWNTs (sc-SWNTs) whose system achieved a high mobility of 0.23 cm2V-1s-1, no Von shift, and a low off-current. PSCs were designed by calculation of density of states (DOS) of backbone structure which was related to charge transfer. The sc-SWNTs were prepared by single cascade of density-induced separation method. We also revealed that binding energy between PSCs and sc-SWNTs was strongly affected by side-chain length of PSCs, leading to the formation of homogeneous nanohybrid film. The understanding of electrostatic interactions in the heterostructure and experimental results suggest criteria for the design of nanohybrid heterostructures.