

Engineering Charge Density Modulation to Optimize Organic Transistor Performances

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In organic field-effect transistors (OFETs), the interface between the electrode or gate dielectric and active layer plays a critical role in determining the charge injection or extraction properties and hence the electrical properties of the device, since these properties are influenced by the heterogeneous nature of the metal/gate dielectric/organic semiconductor (OSC) contacts. Introducing an appropriate functionality on the electrode/gate dielectric surface modulates the interface properties of their bilayers and has been found to be an effective way to improve OFET performance. In the current works, we efficiently optimized the interface characteristics by applying a functionalization of the electrode or the gate dielectric. Our finding clearly showed the surface functionalized gate dielectrics or the formation of asymmetric charge injection/extraction properties at the interfaces between the gate dielectrics or the electrode and OSC interface to be able to result in a dramatic enhancement of the OFET device, and the functionalization of the interface region to be a highly efficient technique that can be used in practical applications.