Highly Sensitive and Selective OFET-Type Sensors Using Synthetic Ionophores: Cucurbit[6]uril Derivatives

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Organic field-effect transistor (OFET)-based devices show great promise for use in chemical and biological sensors. In particular, OFET-based sensors can amplify the electrical signals obtained from binding events with analytes by tuning the applied gate voltage, leading to higher sensitivity compared with conventional sensors that have two electrodes. However, OFET-based sensors without additional functionalization exhibit very low selectivity for target analytes because all analytes can diffuse into the channel region through grain boundaries. Here we report highly sensitive and selective OFET-based sensors functionalized with synthetic ionophores (i.e., receptors) that can selectively hold small organic molecules and ions. A cucurbit[6]uril derivative (CB[6]) was deposited as an ionophore layer onto *p*-channel semiconductor 5,5′-bis-(7-dodecyl-9H-fluoren-2-yl)-2,2′-bithiophene (DDFTTF) layer for the specific analyte binding events. Our approach opens a viable way for the fabrication of high-performance OFET-based sensors.