Development of Water-Stable Organic Semiconductor Materials and Its Sensor Application with Organic Field-Effect Transistors Platform

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Recently, organic field-effect transistors (OFETs) have been emerging as an alternative for sensing technology due to many advantages such as high sensitivity, low-cost, simple fabrication, fast response, and flexible applications. However, OFETs-based sensors still face many challenges include poor stability in an aqueous system. Here, we developed a water-stable organic semiconductor materials through rational molecular design based on a previously reported high-performance semiconductor material, dibenzothiopheno[6,5-b:6′,5′-f]thieno[3,2-b]thiophene (DBTTT). Using DBTTT-derivatives as the semiconductor thin film, we could detect water-based analytes such as sweat with stable operation. Sweat sensors have been extensively investigated in recent years because sweat sensors can detect health biomarkers contained in sweat while being attached to human body. We selected one target component, which is a biomarker of stress-related health conditions in sweat. Our approach offers a viable way for the fabrication of the high-performance OFETs-based sensors compared to classical sensor devices.