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BTBT-based electrolyte-gated organic field-effect transistors with grafted biotin-streptavidin interface layer for biosensing

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Electrolyte gated organic field effect transistors (EGOFETs) are a promising platform for ultrasensitive, fast and reliable detection of biological molecules by low cost, point-of-care bioelectronic sensors. EGOFET's biosensitivity is achieved by modification of one of the transistor's active interfaces – gate or organic semiconductor surface (OSC). Functionalization of the OSC with bioreceptors gives special advantage allowing creation of compact planar device for "lab-on-chip" design. Herein we propose a universal fast and simple technique based on Doctor Blade and Langmuir-Schaefer methods for functionalization of the semiconducting EGOFET surface of C_8-BTBT-C_8 in order to fabricate large scale biorecognition layer with a huge area of sites for further biomodification based on novel functional derivative of BTBT-containing biotin fragment. Then biotinylated layer anchored to the OSC surface can easily be functionalized by various receptors using the well-assessed biotin-streptavidin chemistry. The proposed approach of bioreceptor layer fabrication provides the possibility to create streptavidin platform for further biorecognition using biotinylated aptamers, antibodies, viruses, etc, which can be bound to biorecognition layer without the EGOFET properties degradation. The elaborated EGOFET with biorecognition layer demonstrates efficient work in high ionic strength electrolyte solutions opening the possibility of sensing in real biological liquids.

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