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Abstract

3D printed electrochemical (bio)devices†

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Abstract: Three-dimensional (3D) printing has gained significant attention from industry and research laboratories, as it empowers the end user with the freedom to create in-house and on-demand specialized electrochemical systems adapted to immediate bioanalytical needs. Fused deposition modeling (FDM) is based on the CAD design of the sensor and its printing from thermoplastic filaments. FDM presents advantageous features such as low-cost portable printers, ease of operation, flexibility in the design, design transferability, and thus, it can complement and, in some cases, replace existing fabrication technologies [1-3]. This presentation will discuss our recent developments of 3D-printed integrated chips and their applications to electrochemical (bio)sensing [4-7]. The devices are printed from specific filaments (conductive and non-conductive) at different sizes and shapes, by a dual extruder 3D printer, in order to fit to the demands of various applications. More specifically, integrated all-3D-printed electrochemical microtitration wells for the in-situ and micro-volume quantum dot-based bioassays will be described. Besides, a 3D printed 4-electrode biochip for the enzymatic simultaneous determination of two biomarkers, a 3D printed wearable glucose monitoring device in the form of an electrochemical ring and a 3D printed wearable device in the form of an electrochemical finger for date rape drugs screening will be presented.

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