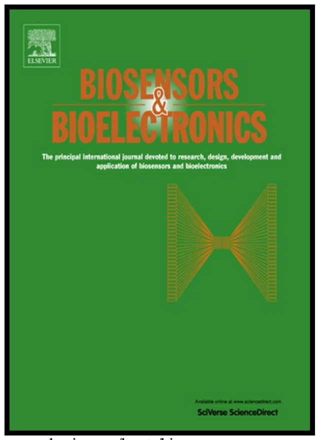

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Direct growth of metal-organic frameworks thin film arrays on glassy carbon electrode based on rapid conversion step mediated by copper clusters and hydroxide nanotubes for fabrication of a high performance non-enzymatic glucose sensing platform

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Abstract. The direct growth of self-supported metal-organic frameworks (MOFs) thin film can be considered as an effective strategy for fabrication of the advanced modified electrodes in sensors and biosensor applications. However, most of the fabricated MOFs-based sensors suffer from some drawbacks such as time consuming for synthesis of MOF and electrode making, need of a binder or an additive layer, need of expensive equipment and use of hazardous solvents. Here, a novel free-standing MOFs-based modified electrode was fabricated by the rapid direct growth of MOFs on the surface of the glassy carbon electrode (GCE). In this method, direct growth of MOFs was occurred by the formation of vertically aligned arrays of Cu clusters and $Cu(OH)_2$ nanotubes, which can act as both mediator and positioning fixing factor for the rapid formation of self-supported MOFs on GCE surface. The effect of both chemically and electrochemically formed $Cu(OH)_2$ nanotubes on the morphological and electrochemical performance of the prepared MOFs were investigated. Due to the unique properties of the prepared MOFs thin film electrode such as uniform and vertically aligned structure, excellent stability, high electroactive surface area, and good availability to analyte and electrolyte diffusion, it was directly used as the electrode material for non-enzymatic electrocatalytic oxidation of glucose. Moreover, the potential utility of this sensing platform for the analytical determination of glucose concentration was evaluated by the amperometry technique. The results proved that the self-supported MOFs thin film on GCE is a promising electrode material for fabricating and designing non-enzymatic glucose sensors.

Keywords: Direct growth, MOFs thin film; Amperometry; Non-enzymatic glucose sensor; Glassy carbon electrode; Surface modification