Dawson-Type Vanadium-Substituted Tungstophosphate-Modified ITO Electrode: Preparation, Characterization and Electrochemical Determination of Dopamine

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In this work, we describe a robust composite film-modified indium tin oxide (ITO) electrode with improved detection capabilities for an example neurotransmitter, dopamine (DA). The composite film was developed by the combination of a Dawson-type vanadium tungstophosphate, α_2 -K₇P₂W₁₇VO₆₂·18H₂O (P₂W₁₇V), and cationic chitosan (CS) via a layer-by-layer (LbL) self-assembly technique. The composite film-modified electrode presents excellent electrochemical catalytic activity towards dopamine (DA) with a linear response over the range of 1.25×10^{-8} M to 3.04×10^{-4} M. The proposed system responds selectively to dopamine with a low detection limit of 0.18 μ M (S/N = 3), a high sensitivity of 0.23 μ A μ M⁻¹ and a quick response time. As a result, the prepared composite film materials with these superior properties show promising applicability in electrochemical sensors.

Keywords: composite film; polyoxometalate; electrochemistry; dopamine

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