Amperometric Assay of Sodium Dodecyl Sulfate Based on Anion Exchange Using PDDA as Active Acceptor

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This study demonstrates a facile and effective strategy for amperometric assay of electrochemically inactive sodium dodecyl sulfate (SDS) based on different binding affinity of poly(diallyldimethylammonium chloride) (PDDA) toward electrochemically inactive SDS and active $[\text{Fe}(\text{CN})_6]^{3-/4-}$ anions. To improve conductivity of the modified electrode nanomaterial, PDDA/GO/SWCNTs hybrid nanomaterial is first prepared and used as the artificial receptor to recognize the anions (i.e., $[\text{Fe}(\text{CN})_6]^{3-/4-}$ and SDS). The stronger binding affinity of the PDDA toward SDS than $[\text{Fe}(\text{CN})_6]^{3-/4-}$ anions results in the decrease of the redox peaks current of surface modified PDDA and provides a quantitative signal readout for the SDS assay. Thereafter, an amperometric assay for SDS based on anion-exchange at $[\text{Fe}(\text{CN})_6]^{3-/4-}$ /PDDA/GO/SWCNTs modified glassy carbon electrode was developed. The ratio of the current decrease shows a linear relationship with SDS concentration range from 1.0 to 200 μM , and the limit of detection of SDS is 36.51 nM. And the results indicate that the study not only provides a simple and effective way to a polyanion of SDS assay, but also opens a new route to developing electrochemical methods for electrochemically inert contaminants by fully utilizing the anion-exchange principles.

Keywords: Poly(diallyldimethylammonium chloride); Differential pulse voltammograms; Electrochemically inactive; Anion-exchange; Sodium dodecyl sulfate;

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