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Designing novel perovskite-type strontium stannate ($SrSnO_3$) and its potential as an electrode material for the enhanced sensing of anti-inflammatory drug mesalamine in biological samples(Article)

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Abstract

The enhanced electrocatalytic activity of an electrode developed with a perovskite-type inorganic material is witnessed very often because of its unique properties. In this view, we synthesized a new perovskite-type sphere-like strontium stannate ($SrSnO_3$) material by a simple co-precipitation method with the assistance of urea, and it was utilized as an electrocatalyst for the electrochemical sensing of anti-inflammatory drug mesalamine (MES). Furthermore, the synthesized $SrSnO_3$ was systematically characterized by FE-SEM, EDX mapping, XRD, Raman spectroscopy, and XPS. The electrochemical properties of the synthesized $SrSnO_3$ were examined by using cyclic voltammetry and differential pulse voltammetry techniques; these techniques indicated that $SrSnO_3$ exhibited better electrochemical oxidation of MES when compared with previously reported catalysts. The $SrSnO_3$-modified glassy carbon electrode (GCE) showed a higher peak current response with a lower detection potential towards sensing MES when compared to unmodified GCE with a broader linear response range (0.01-212 μM), lower detection limit (0.002 μM), and higher sensitivity. Moreover, the modified electrode demonstrated better repeatability, reproducibility, stability, and selectivity even in the presence of potentially interfering compounds such as common inorganic and biological species, which did not disturb the oxidation signal of MES. Furthermore, real sample analysis was performed to investigate the practical feasibility of the synthesized $SrSnO_3$ in human urine, lake water and commercial MES drug samples with satisfactory recovery results. The reported sensor system provides an operative measure for sensing a very low MES content with high selectivity in real sample analysis.

Indexed keywords

EMTREE drug terms: carbon, lake water, mesalazine, perovskite, strontium, strontium stannate, unclassified drug

EMTREE medical terms: Article, catalyst, cyclic potentiometry, differential pulse voltammetry, field emission scanning electron microscopy, human, lake, limit of detection, oxidation, pH, precipitation, priority journal, Raman spectrometry, synthesis, X ray diffraction, X ray photoemission spectroscopy

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