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Innovation of Novel Stone-Like Perovskite Structured Calcium Stannate (CaSnO₃): Synthesis, Characterization, and Application Headed for Sensing Photographic Developing Agent Metol(Article)

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Abstract

Inorganic perovskite-based alkaline earth oxide materials for electrochemical sensing devices are an unwrapped research field yet to be studied. Herein, we designed a novel perovskite-type calcium stannate (CaSnO₃) material with stone-shaped structural morphology synthesized by a simple coprecipitation method with the aid of urea and utilized as an electrocatalyst for the electrochemical detection of photographic developing agent metol (MT). The synthesized CaSnO₃ was systematically characterized with the help of X-ray diffraction (XRD), Raman, Fourier-transform infrared spectroscopy (FT-IR), field emission scanning electron microscopy (FESEM), energy-dispersive X-ray spectroscopy, elemental mapping analysis, high resolution transmission electron microscope (HR-TEM), and electron spectroscopy for chemical analysis (ESCA). Furthermore, the electrochemical property of CaSnO₃ was examined by cyclic voltammetry and differential pulse voltammetry techniques. As a result, CaSnO₃ modified with a glassy carbon electrode (CaSnO₃/GCE) implies better electrocatalytic activity with an enhanced redox peak response, wider linear range (0.01-123 μM), lower detection limit (0.003 μM), and appreciable sensitivity toward the detection of MT. In addition to that, the CaSnO₃ modified electrode has excellent selectivity with the existence of potentially interfering compounds such as cationic/anionic species and biological substances. Moreover, the CaSnO₃ modified electrode has better reproducibility, repeatability, and storage stability. Further, the practical viability of the synthesized CaSnO₃ was investigated by using lake water as a real sample, revealing reasonable recovery results. © 2020 American Chemical Society.

Author keywords

Differential pulse voltammetry technique [Metol](#) [Perovskite CaSnO₃](#) [Photographic developing agent](#) [Redox behavior](#)

Indexed keywords

Engineering controlled terms:

[Alkalinity](#) [Calcium](#) [Chemical detection](#) [Cyclic voltammetry](#) [Electrocatalysts](#)
[Electron spectroscopy](#) [Energy dispersive spectroscopy](#) [Field emission microscopes](#)
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