

Pechini method synthesis of Ho_2O_3 nanoparticles and its applications as a extremely sensitive electrochemical sensor for Diuron detection in tap water, apple and strawberry juice samples

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Industrialization and intensive agricultural practices, which are connected to problems with flora and fauna and cause decrease in water quality owing to pollution by persistent and dangerous pesticides, have been encouraged by population increase¹. In the current study, a new electrochemical sensor for Diuron (DU) detection was developed using a carbon paste electrode (CPE) enhanced with Ho_2O_3 nanoparticles. Rare earth elements, such as Ho, are increasingly being employed to create novel electrode nanocomposites with improved electrocatalytic performance. Holmium has been regarded a major lanthanide element with higher redox reaction characteristics². The synthesis of Ho_2O_3 was carried out using the Pechini method for the first time, and the morphology and nanostructure of the material were confirmed by the use of X-ray powder diffraction (XRPD), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). To develop an analytical method for DU identification and measurement, the electrocatalytic properties of the proposed Ho_2O_3 modified CPE were investigated. The electrochemical behaviour of DU at the Ho_2O_3 sensor was examined using the CV and SWV methodologies. The electrochemical sensor that was suggested had a remarkable response to DU, displaying a broad linear range of 0.25 to 200 μM , a detection limit of 0.03 μM , and a sensitivity of 2,14 $\mu\text{A } \mu\text{M}^{-1} \text{ cm}^{-2}$. The method's strong selectivity is confirmed by the minimal influence of potential interfering substances. Additionally, the sensor demonstrated outstanding stability, repeatability, and sensitivity. Furthermore, the Ho_2O_3 -CPE sensor showed good recovery results when used to detect DU in water, apple, and strawberry samples. Also, its efficacy was validated by its successful use in the accurate measurement of DU levels in real samples, which was compared with conventional DU detection methods including UV-VIS detection.

References

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