

Electrocatalytic oxidation of ascorbic acid mediated by ZnO microcrystalline modified glassy carbon electrode.

Abstract

Modification of a glassy carbon (GC) electrode surface by adhered microparticles of zinc oxide (ZnO) using electrochemical performance of microparticles of ZnO/GC electrode shows excellent electrocatalytic activity towards the oxidation of ascorbic acid in 0.1 M KH_2PO_4 electrolyte solution by cyclic voltammetry (CV). This paper seeks to critically examine the modification of GC electrode with Zinc oxide microparticles and the effect on oxidation of ascorbic acid using cyclic voltammetry technique. ZnO/GC electrode exhibited obvious enhancing and electrocatalyzing effect as it causes the oxidation current of ascorbic acid to increase by 1.5 times as compared to bare GC electrode. The sensitivity under conditions of cyclic voltammetry is significantly dependent on pH and ZnO dosage. The variation of scan rate study shows that the system undergoes diffusion-controlled process. Diffusion coefficient and rate constant of ascorbic acid were determined using hydrodynamic method (rotation disk electrode) with values of $5.4 \times 10^{-6} \text{cm}^2 \text{s}^{-1}$ and $2.5 \times 10^{-3} \text{cm} \text{s}^{-1}$ respectively for unmodified electrode, while the values of diffusion coefficient and rate constant of ascorbic acid using ZnO/GC electrode were $5.7 \times 10^{-6} \text{cm}^2 \text{s}^{-1}$ and $2.1 \times 10^{-3} \text{cm} \text{s}^{-1}$ respectively.

Keyword: Zinc oxide microcrystalline; Modified GC electrode; Ascorbic acid; Cyclic voltammetry