Electrochemical Sensor Based on CuO nanoparticles-modified graphene oxide (CuO@GO) nanocomposites for Determination of Zearalenone Mycotoxins in Food Samples

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doi: 10.20964/2021.04.59

Received: 18 December 2020 / Accepted: 2 February 2021 / Published: 28 February 2021

This study reported the preparation of CuO nanoparticles-modified graphene oxide (CuO@GO) nanocomposites as an electrochemical sensor for determination of zearalenone mycotoxins in food samples. Hummer's method was used to synthesize the graphene oxide (GO) and CuO@GO nanocomposites on glassy carbon electrodes (GCE). Morphology and phase composition studies of the samples using SEM and XRD analysis showed that aggregated nanosheets of GO with graphitic carbon crystalline planes were synthesized. For CuO@GO nanocomposites, the CuO nanoparticles with monoclinic crystalline phase were uniformly dispersed and anchored on the GO nanosheets. The electrochemical characterization was done by CV and DPV techniques which revealed that limit of detection, sensitivity and linear range for determination of zearalenone on CuO@GO/GCE were obtained 0.012 ng ml^{-1} , $0.4895 \mu\text{A/ng ml}^{-1}$ and 10 to 150 ng ml^{-1} , respectively. The response of the sensor was studied in presence of the interfering substances that showed acceptable, repeatable, stable and high selectivity responses of the prepared zearalenone sensor. The sensor performance for determination of zearalenone in milk samples were investigated that indicated the acceptable precision to determine zearalenone in real samples. As a result, modification of GO/GCE electrode with CuO nanoparticles improve the zearalenone sensing properties due to high electrical conductivity, the morphology of nanoparticles, and the synergistic effect of CuO nanoparticles and GO nanosheets.

Keywords: Electrochemical sensor; Graphene oxide; CuO nanoparticles; Nanocomposites; Zearalenone; Food samples

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