Electrochemical Detection of Nitrofurazone and its Metabolite Using Glassy Carbon Electrode Modified by Fe₃O₄ Functionalized Graphene

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A new electrochemical sensor that designed by using a glassy carbon electrode modified with graphene and Fe₃O₄ nanoparticles (Gr/Fe₃O₄/GCE) was used to detect nitrofurazone and semicarbazide hydrochloride. The successful synthesis of composite materials Fe₃O₄ functionalized graphene overcame the aggregation on the surface of GCE successfully and performed higher catalytic activity, reduced the interfacial resistance, and made the electron transfer easier. Under the optimal conditions, the obtained sensor presented linear response to nitrofurazone in the range of 1.0×10^{-5} to 1.09×10^{-4} mol/L, the linear regression equation was $i_{pc} (10^{-6}A) = -0.0219c (10^{-6}mol/L) - 3.5303$ with linear correlation coefficient was 0.9815. The detection limit was 2.92×10^{-6} . The linear range of semicarbazide hydrochloride was 1.0×10^{-6} to 1.09×10^{-4} mol/L and the linear regression equation was $i_{pa} (10^{-6}A) = 0.0240c (10^{-6}mol/L) + 0.7497$ with linear correlation coefficient was 0.9992. The detection limit was 6.17×10^{-7} mol/L. The recovery rate of nitrofurazone and semicarbazide hydrochloride was 80.8%~86% and 83.4%~86.1%, respectively.

Keywords: Electrochemical detection; Nitrofurazone; Semicarbazide hydrochloride; Fe₃O₄ functionalized graphene; Glassy carbon electrode

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