Highly Sensitive Electrochemical Sensor Based on rGO/Fe₃O₄ Composite as Electrocatalyst for Clenbuterol Detection in Doping Analysis

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Clenbuterol has anabolic effects as a doping agent and is banned by the World Anti-Doping Agency for use by athletes. If an athlete consumes pork with clenbuterol residues, it may cause a positive urine test result, which will seriously affect the athletic career. In this work, an electrochemical sensor for the detection of clenbuterol was proposed. Two reduced graphene oxide/Fe₃O₄ (rGO/Fe₃O₄) nanocomposites were prepared by solvent thermal and hydrothermal methods. Different rGO/Fe₃O₄ were characterized and compared with FT-IR, XRD, SEM, and Zeta potential meters. The results show that the rGO/Fe₃O₄ prepared by different methods vary in surface functional groups, Fe₃O₄ crystal structures and particle sizes, surface morphology and surface charge. The electrode was modified with rGO/Fe₃O₄ and the detection performance of the sensor for clenbuterol was investigated. Under optimal conditions, the electrochemical sensor could linearly detect clenbuterol from 1 μM - 128 μM with a detection limit of 120 nM. In addition, this electrochemical sensor has been successfully used for the detection of clenbuterol in swine urine.

Keywords: Reduced graphene oxide/Fe₃O₄; Doping; Clenbuterol; Adsorption

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