A Sensitive Electrochemical Sensor Based on Graphene/Pt Nanoparticles for Simultaneous Determination of Tyrosine and Tryptophan in the Presence of 5-hydroxytryptophan

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A composite material, namely, graphene/ Pt nanoparticles (GR/PtNPs) was prepared in this work. This composite material was characterized by transmission electron microscopy (TEM) and Fourier transform infrared spectroscopy (FTIR). Based on GR/PtNPs modified glassy carbon electrode (GR/PtNPs/GCE), a sensitive and simple sensor was developed for simultaneous measurement of tryptophan (Trp) and tyrosine (Tyr) in the presence of 5-hydroxytryptophan(5-HTP). Under optimized measurement conditions, the oxidation peak current of Tyr increased linearly within a concentration range from 5.0×10^{-7} to 2.0×10^{-5} mol/L with a detection limit of 1.25×10^{-7} mol/L. The linear response of Trp was also obtained in the range from 2.0×10^{-7} to 1.2×10^{-5} mol/L, and the detection limit was 8.22×10^{-8} mol/L. When Tyr and Trp samples were measured, the recovery rate of tyrosine was 98.4% to 103.5%, and the recovery rate of tryptophan was 98.7% to 102.9%, which indicates that the accuracy of GR/PtNPs/GCE was high. Additionally, the GR/ PtNPs/GCE demonstrated suitable selectivity for the determination of tryptophan (Trp) and tyrosine (Tyr), making it practicable for their measurement of Trp and Tyr in pharmaceutical formulations.

Keywords: Graphene; Sodium polystyrene sulfonate; Pt nanoparticles; Tyrosine; Tryptophan

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