A Novel Solid-State Electrochemiluminescence Sensor Based on poly(3-amino-4 hydroxybenzenesulfonic acid) /Ru(bpy)₃²⁺ Modified Electrode for Determination of Malachite Green

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The poly(3-amino-4-hydroxybenzenesulfonic acid)/Ru(bpy)₃²⁺ modified glassy carbon electrode (PAHBS/Ru(bpy)₃²⁺/GCE) is a novel solid-state electrochemiluminescence (ECL) sensor. It was prepared by electropolymerization of 3-amino-4-hydroxybenzenesulfonic acid (AHBS) followed by soaking into Ru(bpy)₃²⁺ solution. Ru(bpy)₃²⁺ was entrapped on the electrode via the electrostatic interactions between sulfonic acid groups and Ru(bpy)₃²⁺ cation. The morphology and composition of the modified electrodes were analysed using scanning electron microscope and energy-dispersed spectrum. Cyclic voltammetry and electrochemical impedance spectroscopy were used to compare the electrochemical behavior of the electrodes before and after modification. Under the optimal conditions, the ECL intensity of the quenching value (ΔECL) versus the logarithm of the concentration of malachite green (MG) was linear over a concentration range from 5.0×10^{-8} to 1.0×10^{-5} mol L⁻¹ ($r = 0.9931$) and the limit of detection (LOD) was 2.5×10^{-8} mol L⁻¹. This method has been successfully applied to the determination of MG in pond water.

Keywords: 3-amino-4-hydroxybenzenesulfonic acid, electrochemiluminescence, Ru(bpy)₃²⁺, malachite green, sensor

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