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CoS_2-decorated ionic liquid-functionalized graphene as a novel hydrazine electrochemical sensor

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Abstract

Cobalt disulfide-decorated ionic liquid-functionalized graphene nanocomposites were prepared herein and characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), and X-ray photoelectron spectroscopy (XPS). The as-prepared nanocomposites were subsequently used to build a modified glassy carbon electrode serving as a hydrazine (N_2H_4) electrochemical sensor. The electrocatalytic performance of the prepared sensor towards the N_2H_4 oxidation reaction was evaluated by cyclic voltammetry (CV) and amperometric methods. A linear dependence was found between the oxidation peak current and the concentration of N_2H_4. Thus, linear calibration plots were obtained over wide linear ranges of 5-100 μM (R^2 = 0.9898) and 100-400 μM (R^2 = 0.9852), with a relatively low detection limit of 0.39 μM (S/N = 3). The prepared sensor exhibited good electrocatalytic performance (i.e., sensitivity, reproducibility, and selectivity) towards the detection of N_2H_4. The sensor was successfully used for the practical determination of N_2H_4 in lake water samples with satisfactory recoveries.

Graphical Abstract