Short Communication

Synthesis of a Crystal Violet-Cadmium Hydroxyquinoline Iodine Nanocomposite for the Photoelectrochemical Sensing of Ascorbic Acid

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A crystal violet-cadmium hydroxyquinoline iodine (CV-Cdqi) nanocomposite was synthesized by adsorbing crystal violet (CV) onto cadmium hydroxyquinoline iodine (Cdqi) nanowires. The Cdqi nanowires were synthesized by mixing 100 mL of an aqueous 0.03 M CdI₂ solution with 100 mL of a 0.01 M 8-hydroxyquinoline ethanol solution in an ultrasonic bath. Scanning electron microscopy showed that Cdqi exhibited a regular nanorod morphology with diameters of 30–60 nm and lengths of 400–600 nm. After adsorbing crystal violet, the Cdqi nanowires become aggregated to form the CV-Cdqi nanocomposite. X-ray powder diffraction (XRD) revealed that the XRD patterns of the Cdqi nanowires and CV-Cdqi nanocomposite are essentially the same, and no new phase was generated in the XRD pattern after the adsorption of CV. The fluorescence and photoelectrochemical (PEC) properties of the CV-Cdqi nanocomposite were investigated. The CV-Cdqi nanocomposite emits a yellow-green fluorescence with a maximum emission at 575 nm, which is similar to that of the Cdqi nanowires. PEC measurements showed that the photocurrent response of the CV-Cdqi nanocomposite spin-coated FTO electrode was stable and repeatable under the periodic on/off illumination of a 300 W xenon lamp at 0 V bias. Furthermore, the CV-Cdqi/FTO electrode was used to construct a sensor for the PEC detection of ascorbic acid (AA). In the range of 1.4 to 10 µM, the photocurrent of the CV-Cdqi/FTO electrode was inversely proportional to the concentration of AA with a detection limit of 0.2 µM. The method was used for the determination of AA in oranges (varied from 32.1 to 50.8 mg/100 g fresh weight).

Keywords: Crystal violet; cadmium hydroxyquinoline iodine; nanocomposite; photochemical sensing; ascorbic acid

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