Glutathione Modified Nitrogen-doped Carbon Dots for Dopamine Detection Based Fluorescence Analysis

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Abstract

A novel water-soluble carbon dot nanoparticle for detecting dopamine with a simple and highly efficient method has been obtained. The N-doped carbon dot (NCDs) nanoparticles were synthesized by using a typical and facile hydrothermal route. The as-prepared NCDs were further passivated by attaching L-glutathione (GSH) though carbodiimide-activated coupling reaction on the NCDs surface (termed as GSH-NCDs). The GSH-NCDs particles showed an intriguing blue fluorescence with the emission wavelength at 440 nm when excited at 355 nm wavelength. The effect of different biomolecules towards the fluorescence of GSH-NCDs showed selective and sensitive DA sensing. For DA sensing, the limit of detection was calculated to be 1.01 nM, with a linear detection range of 0.02-10 μM. The fluorescence quenching was due to the interaction between GSH-NCDs and DA through GSH-DA electrostatic interaction. The as-designed sensing platform was successfully applied for biological sample analysis.

Keywords: Glutathione, Carbon dots, Dopamine sensor, Fluorescent