

Title: Synthesis of Fluorescent Nitrogen and Phosphorous Co-doped Carbon Quantum Dots for Sensing of Iron, Cell Imaging and Antioxidant Activities

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Abstract

Carbon quantum dots (CQD) as the result of their exceptional physical and chemical properties show tremendous potential in various field of applications like cell imaging and doping of CQDs with elements like nitrogen and phosphorous increase its fluorescence property. Herein, we have synthesized fluorescent nitrogen and phosphorous codoped carbon quantum dots (NPCQDs) via a one-pot hydrothermal method. Sesame oil, L-Aspartic acid, and phosphoric acid were used as carbon, nitrogen, and phosphorous sources, respectively. UV-Vis spectrophotometer, fluorescence spectrometer, Fourier transform infrared spectrometer (FTIR), X-ray diffraction spectrometer (XRD), field emission scanning microscopy (FESEM), and transmission electron microscopy (TEM) were employed to characterize the synthesized fluorescent NPCQDs. The as-synthesized NPCQDs with a particle size of 4.7 nm possess excellent water solubility, high fluorescence with high quantum yield (46%), high ionic stability, and resistance to photo bleaching. MTT assay indicated the biocompatibility of NPCQDs and it was used for multicolor live-cell imaging. Besides, the NPCQDs show an effective probe of iron ions (Fe^{3+}) in an aqueous solution with a high degree of sensitivity and selectivity. The DPPH assay showed its good antioxidant activity.

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