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Synthesis and Characterization of Biomass CQDs Doped $WO_{2.72}$

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Abstract

Biomass carbon quantum dots (CQDs) were widely used in bioimaging and $WO_{2.72}$ has great potential in cancer therapy. The biomass CQDs were prepared by mixed acid oxidation method with biomass materials such as pods, tobacco leaves and cysteine as carbon sources. Properties of biomass carbon quantum dots were characterized, including micromorphology, the functional group composition, photoluminescence properties and fluorescence labeling ability in HepG2 cells. And the cytotoxicity of CQDs in HepG2 and MCF-7 cells was tested. In this paper, in situ loading of biomass CQDs on one dimensional long rod like $WO_{2.72}$ (C-$WO_{2.72}$) was synthesized by solvothermal method. Properties of C-$WO_{2.72}$ were characterized, including the phase composition, the functional group composition, micromorphology and absorbability.

Keywords: CQDs, Tungsten oxide, Bioimaging

1. Introduction

CQDs[1-3] are a new development branch in the field of nanocarbon materials[4]. It has excellent physical and chemical properties such as fluorescence[5,6], upconversion luminescence[7], and biocompatibility[8]. Among the outstanding physical and chemical properties of CQDs, its optical properties are the most prominent characteristics, with the extensive value of research and broad application prospects[9,10]. The optical properties of CQDs include ultraviolet-visible absorption, photoluminescence[11], photostability[12], upconversion fluorescence emission, pH dependence[13] and Biocompatibility[14,15], which can be used for photoelectric conversion[16], photoelectrocatalysis[17], bioimaging[18], et al.

In recent years, biomass materials have been widely concerned as carbon sources for the preparation of CQDs[19,20]. Biomass materials have a wide range of sources, complex composition and excellent biocompatibility. Due to the complex composition of biomass materials, various doping elements can be provided for CQDs[21,22]. The application of biomass CQDs to cell fluorescence imaging has the following advantages. As one of the important elements constituting a living organism, carbon is excellent in biocompatibility. The CQDs have excellent fluorescence stability. CQDs have a small particle size, which is easily endocytosed by cells and can be excreted by organisms[23]. Researchers often use the advantages of CQDs to form a composite system with metal oxides or organometallic ligands[24,25].

At present, tungsten oxide is a research hotspot. [26,27]. $WO_{2.72}$ has a highly tunable structure and unique physicochemical properties that have potential for applications in photocatalysis[28], electrochemistry[29], Photothermal conversion[30] and photothermal therapy[31]. $WO_{2.72}$ has applications in cancer treatment and biological tissue characterization.