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Facile preparation of surface functional carbon dots and their application in doxorubicin hydrochloride delivery

Xin Zhang^{a,b}, Yongbo Wang^a, Wenwei Liu^a, Xuhua Liang^a, Boni Si^a, Enzhou Liu^a, Xiaoyun Hu^c, Jun Fan^{a,*}

^a*School of Chemical Engineering, Northwest University, No. 229 Taibai North Road, Xi'an, Shaanxi, 710069, PR China.*

^b*School of pharmacy, ShaanXi University of Chinese Medicine, Xianyang, Shaanxi, 712046, PR China.*

^c*School of Physics, Northwest University, No. 229 Taibai North Road, Xi'an, Shaanxi, 710069, P. R. China.*

ABSTRACT A novel form of carbon dots (PEG-CDs) was prepared by using one-step hydrothermal synthesis with glycine as the precursor and polyethylene glycol (PEG)-2000 as the surface modifier. The prepared PEG-CDs were characterized with HRTEM, XRD, PL, FTIR and UV. The results showed that they were quasi spherical particles with a diameter of approximately 12 nm and had a fine fluorescence property, good water solubility, favorable stability and high quantum yield with 28.58%. Doxorubicin hydrochloride (DOX) as a potential anti-cancer drug was loaded on the PEG-CDs. The drug loading capacity was 24.25 mg/g and the encapsulation efficiency was 77.23% at pH 9.0 with 36 hrs of dialysis; DOX release in PBS system with a pH of 5.5 could reach up to 76.67% in 23 hrs.

Keywords: PEG-CDs; Functional; Luminescence; DOX; Drug Loading; Drug Release

1. Introduction

Carbon dots (CDs) are novel fluorescent materials and have been paid great attention by researchers in recent years. CDs are nano crystalline with a quasi spherical structure and their luminescence performance depend on particle dimensions and excitation wavelength; besides they have stable fluorescence property and anti-bleaching nature [1]. Compared to traditional semiconductor quantum dots [2,3], CDs have notable virtues, such as low toxicity, favorable biocompatibility, convenient synthesis on a large-scale and low cost [4,5]. The researches on CDs are mainly focused on biological imaging and molecular detection, however, they are rarely

* Corresponding author:

E-mail: fanjun@nwu.edu.cn; Tel: +86 2988305252

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