Sonochemically synthesized blue fluorescent functionalized graphene oxide as a drug delivery system

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PII: S1350-4177(17)30514-X
DOI: https://doi.org/10.1016/j.ultsonch.2017.11.010
Reference: ULTSON 3947

To appear in: *Ultrasonics Sonochemistry*

Received Date: 4 August 2017
Revised Date: 6 November 2017
Accepted Date: 6 November 2017

Please cite this article as: H. Hashemi, H. Namazi, Sonochemically synthesized blue fluorescent functionalized graphene oxide as a drug delivery system, *Ultrasonics Sonochemistry* (2017), doi: https://doi.org/10.1016/j.ultsonch.2017.11.010

Sonochemically synthesized blue fluorescent functionalized graphene oxide as a drug delivery system

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Abstract: ultrasound assisted the copper-catalyzed cross-coupling reaction to synthesis 1-(10-bromoanthracene-9-yl)-1H-imidazole-4,5-dicarboxylic acid (A-Im). The obtained product was employed to modify graphene oxide (GO) surface to produce GO-A-Im. The resulted hybrid was characterized with Scanning Electron Microscope (SEM/EDS); X-ray Diffraction spectroscopy (XRD); X-Ray photoelectron spectroscopy (XPS); Fluorescence spectroscopy; Fourier transformed infrared spectroscopy (FT-IR), Brunauer–Emmett–Teller (BET), and UV-Vis absorption spectroscopy. The synthesized (A-Im) moiety that was used for functionalization of GO, display a cyan emission around (496 nm), however, the GO hybrid exhibited blue photoluminescence around (403 nm). It has been proposed that the chemical attachment of the A-Im moiety onto GO surface leads to a distortion in the bandgap of the GO and the blue shift of luminescence [93 nm] was observed. Indeed the cytotoxicity properties of the synthesized hybrid were measured**.** The IC_{50} value for the hybrid was 23 µg/ml. The model drug (DOX) was loaded up to 91% on the carrier, and the release profile indicated a pH-dependent discharge with more release in acidic pH. The GO-A-Im/DOX was injected to the 4T1 tumor (murine breast cancer) bearing BALB/c mice and after 10 days the tumor was disappeared.

Keywords: Ultrasound, Graphene Oxide, Luminescence, Cytotoxicity

1. Introduction

Ultrasonic irradiation could smooth the reaction condition in homogeneous or heterogeneous systems, through decreasing the time and increasing the selectivity of a reaction. This characteristic behavior of ultrasound refers to bubble forming mechanism called cavitation that is the result of turbulence created in liquid [1-3]. The temperature and the pressure of vapors being stuck within the bubbles might be several thousand kelvin and atmosphere respectively. In fact, these bubbles act as microreactors in which as the bubbles collapse, the released energy reduce the distance between molecules and increase the collision speed among them, by which the required activation energy will be decreased[4]. Ultrasound waves (USW) could enhance the reactivity of reagents either by eliminating the passivating surface coating, reducing the particle size, elevating the mass conduction or by the formation of surface flaws[5]. Easy and cheap preparation and modification procedure of graphene, extensive π conjugated

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