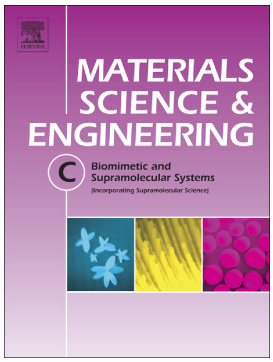

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Doxorubicin loaded carboxymethyl cellulose/graphene quantum dot nanocomposite hydrogel films as a potential anticancer drug delivery system

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Abstract

Creating anticancer properties in the hydrogel film could make it as a candidate for treating cancer tissues. In this work, a novel hydrogel nanocomposite films with anticancer properties were designed via incorporation of graphene quantum dot (GQD) as a nanoparticle into carboxymethyl cellulose (CMC) hydrogel and using doxorubicin (DOX) as drug model with broad-spectrum anticancer properties. Drug release studies carried out at two different pHs and the MTT assay was evaluated for DOX-loaded CMC/GQD nanocomposite hydrogel films against blood cancer cells (K562). The prepared nanocomposite hydrogel films were characterized using Fourier transform infrared (FT-IR), UV–Vis spectroscopy, scanning electron microscopy (SEM), permeability and mechanical properties. The prepared CMC/GQD nanocomposite hydrogel films showed an improvement in vitro swelling, degradation, water vapor permeability and pH-sensitive drug delivery properties along with not significant toxicity against blood cancer cells (K562). According to the obtained results, this nanocomposite hydrogel films can be proposed to use as an anticancer film and drug delivery system.

Keywords: nanocomposite hydrogel; graphene quantum dot; drug delivery

1. Introduction

In the past years, GQDs has been more attention, due to their strong quantum confinement and edge effects [1-3]. Enormous efforts were devoted to the GQDs synthesis (bottom-up and top-down methods) and determining their properties [4-6], while their applications in biomedical field have not been extensively studied. GQDs are appearing as undertaking materials for biomedical applications [6-9]. Due to the GQDs have high fundamental fluorescence, large surface area with delocalized electrons, unparalleled excitation relevant emission, solubility in