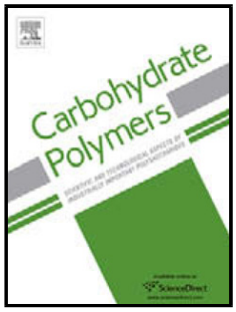

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Carboxymethyl cellulose/graphene oxide bio-nanocomposite hydrogel beads as anticancer drug carrier agent

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Highlight

- GO nano sheets were successfully embedded on the CMC hydrogel beads.
- Incorporation of GO nano sheets greatly improved swelling capacity of hydrogels.
- GO-CMC has high loading and prolonged release for Doxorubicin compare to pure CMC.
- GO-CMC has no significant toxicity against colon cancer cells (SW480).

Abstract

Biodegradable carboxymethyl cellulose/graphene oxide (CMC/GO) nanocomposite hydrogel beads as a drug delivery system were prepared via physically crosslinking with $FeCl_3.6H_2O$ for controlled release of anticancer drug doxorubicin (DOX). The π-π stacking interaction between DOX and GO resulted in higher loading capacity and controlled release of the DOX loaded from CMC/GO nanocomposites hydrogel. The release profile of DOX from hydrogel beads at pH 6.8 and 7.4 indicated it's strongly pH dependence. Interaction between GO and DOX with H-bonding could be unstable under acidic conditions which resulted in faster drug release rate in pH 6.8. The formation of GO nanoparticles in the hydrogels was confirmed using X-ray diffraction (XRD), and the chemical structure and morphology of the prepared CMC/GO nanocomposite hydrogel beads were characterized using Fourier transform infrared spectroscopy (FT-IR), SEM and Transmission electron microscopy (TEM). In addition, swelling behavior of nanocomposite hydrogels was investigated in PBS solution.

Keywords: Drug delivery; Graphene oxide; Carboxymethyl cellulose; Nanocomposite; Hydrogel.

1. Introduction

Super-absorbent polymers have been known as an active compounds in biomedical and engineering fields including in biosensors, tissue implants, drug delivery systems (DDS) (Hoare & Kohane, 2008; Hoffman, 2012). Hydrogel is a macromolecular polymeric gel synthesized by crosslinking of polymer