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Quince Seed Mucilage (QSD)/ Multiwall Carbonano Tube Hybrid Hydrogels as Novel Controlled Drug Delivery Systems

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Abstract : The aim of this study is to synthesize several series of hydrogels from combination of a natural based polymer (Quince seed mucilage QSD), a synthetic copolymer contained methoxy poly ethylene glycol -polycaprolactone (mPEG-PCL) in the presence of different amount of multi-walled carbon nanotube (f-MWNT). Mono epoxide functionalized mPEG (mP EG-EP) was synthesized and reacted with sodium azide in the presence of NH4Cl to afford mPEG- N3(-OH). Then ring opening polymerization (ROP) of ε–caprolactone (CL) in the presence of mPEG- N3(-OH) as initiator and Sn(Oct)2 as catalyst led to preparation of mPEG-PCL- N3(-OH) which was grafted onto propagylated f-MWNT by the click reaction to obtain mPEG-PCL- f-MWNT (-OH). In the presence of mPEG- N3(-Br) and mixture of NHS/DCC/ QSD, hybrid hydrogels were successfully synthesized. The copolymers and hydrogels were characterized using different techniques such as, scanning electron microscope (SEM) and thermogravimetric analysis (TGA). The gel content of hydrogels showed dependence on the weight ratio of QSD:mPEG-PCL:f-MWNT. The swelling behavior of the prepared hydrogels was also studied under variation of pH, immersion time, and temperature. According to the results, the swelling behavior of the prepared hydrogels showed significant dependence in the gel content, pH, immersion time and temperature. The highest swelling was observed at room temperature, in 60 min and at pH 8. The loading and in-vitro release of quercetin as a model drug were investigated at pH of 2.2 and 7.4, and the results showed that release rate at pH 7.4 was faster than that at pH 2.2. The total loading and release showed dependence on the network structure of hydrogels and were in the range of 65- 91%. In addition, the cytotoxicity and release kinetics of the prepared hydrogels were also investigated.

Keywords : antioxidant, drug delivery, Quince Seed Mucilage(QSD), swelling behavior
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