

Synthesis and Gelation of β -Cyclodextrin Inclusion based Supramolecular Network for Controlled Drug Delivery

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β -Cyclodextrin (β -CD) inclusion based supramolecular networks exhibit interesting properties which make them potential candidates in novel drug delivery applications. This research focused on the synthesis and characterization of two building blocks, namely, BB1 and BB2 to construct a novel supramolecular network with the intention of developing an efficient multi-responsive novel hydrogel for controlled drug delivery. BB1, poly (β -cyclodextrin-co-citric acid), and BB2, citric acid ester of phenyl-mono-capped PEG-4000 were synthesized using modified literature procedures and characterized using UV-visible, Fourier transform infrared spectroscopy and high performance liquid chromatography. After studying the supramolecular network formation between BB1 and BB2 in phosphate buffered saline pH 7.4 and aqueous media, using UV-visible spectroscopy, supramolecular hydrogel formation study was performed using a vial inversion test. UV-visible analysis of a mixture of BB1 and BB2 demonstrated an enhancement of absorbance with respect to the UV-visible absorbance of each individual building block. This observation indicates the supramolecular network formation between building blocks via inclusion between β -CD of BB1 and phenyl groups of BB2. Vial inversion test indicates the sol-gel transition of the BB1-BB2 supramolecular network to a hydrogel. In conclusion, the supramolecular network of BB1 and BB2 undergo gelation. These research findings could support further optimization and characterization of the hydrogel to obtain a biomaterial with optimal rheological properties for drug delivery applications.

Keywords: β -Cyclodextrin, citric acid, hydrogels, polyethylene glycol, supramolecular polymers

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