

Advanced Catechol-Modified Chitosan Hydrogels with the Inducement of Iron (III) Ion at Acidic Condition

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Abstract : Chitosan (CS) is a natural polycationic polysaccharide and pH-sensitive polymer with incomplete deacetylation from chitin. It is also a guaranteeing material in terms of pharmaceutical, chemical, and sustenance industry due to its exceptional structure (reactive -OH and -NH₂ groups). In this study, a catechol-functionalized chitosan (CCS, for an eminent level for substitution) was synthesized and propelled by marine mussel cuticles in place on research those intricate connections between Fe³⁺ and catechol under acidic conditions. The ratios of catechol, chitosan and other reagents decide the structure of the hydrogel. The gel formation is then well-maintained by dual cross-linking through electrostatic interactions between Fe³⁺ and CCS and covalent catechol-coupling-based coordinate bonds. The hydrogels showed enhanced cohesiveness and shock-absorbing properties with increasing pH due to coordinate bonds inspired by mussel byssal threads. Thus, the gelation time, rheological properties, UV-vis and ¹H-Nuclear Magnetic Resonance spectroscopy, and the morphologic aspects were elucidated to describe those crosslinking components and the physical properties of the chitosan backbones and hydrogel frameworks.

Keywords : catechol, chitosan, iron ion, gelation, hydrogel

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