Dual-Crosslinked Hydrogel System for Controllable Gelation and Physicochemical Characteristics

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Abstract:

The development of injectable hydrogels with shear-thinning and recovery properties is essential for biomedical applications, such as drug and cell delivery. Despite progress, achieving rapid gelation alongside high stability in hydrogels with dynamic bonding remains a significant challenge. The study in this research addresses this issue by combining thermogelling octanoyl glycol chitosan (OGC) with oxidized hyaluronic acid (OHA) to create a hydrogel system with dynamic crosslinking properties. The resulting hydrogel exhibits desirable properties, including excellent injectability, self-healing capabilities, and rapid gelation, making it suitable for diverse biomedical uses. Additionally, the hydrogel's mechanical strength is highly tunable, attributed to dynamic Schiff-base reactions and multiple physical interactions within the polymer network. The ability to customize the hydrogel's physicochemical characteristics by adjusting polymer composition and concentration highlights its versatility. These features demonstrate the potential of this hydrogel system for a range of applications, particularly in drug delivery and tissue engineering, where controlled gelation and stability are critical.