

Tough and anti-swelling naturally derived adhesives by long-chain toughening and electrostatic attraction

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[Extended Abstract](#)

Abstract

Simultaneous achievement of anti-swelling properties and strong tissue adhesion in hydrogel adhesives is crucial for their medical applications. In this paper, an effective strategy combining long-chain toughening and electrostatic attraction induced anti-swelling is proposed. Natural macromolecular hydrogel adhesives composed by loosely crosslinked macromolecular network and polyelectrolyte microspheres is designed. The hydrogel can achieve intrinsic toughening by increasing the chain length of the polymer network. And by introducing polyelectrolyte microspheres, excellent anti-swelling property is achieved through the electrostatic attraction between polyelectrolyte microspheres and the polymer network. The prepared hydrogel adhesive was able to achieve up to 100 J/m² adhesion energy with a variety of porcine tissues, and the hydrogel showed excellent anti-swelling properties with swelling ratio of 1.13 at 37°C for 24 h in wet environment. By changing the influencing factors, the anti-swelling mechanism of the hydrogel was investigated, and the design basis for the anti-swelling hydrogel was provided.

Keywords:

hydrogel adhesives anti-swelling tough tissue adhesion