

Hydrogen Bonding-based Strongly Adhesive Coacervate Hydrogels Synthesized Using Poly(N-vinylpyrrolidone) and Tannic Acid

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Among the number of substances that can induce supramolecular assembly, phenolic species such as dopamine are widely utilized for synthesizing adhesive materials. However, despite the strong adhesion capability of monomeric phenol, it lacks cohesive strength and rarely forms a supramolecular gel to secure its mechanical properties. In this study, to overcome this obstacle, we synthesized a supramolecular coacervate hydrogel by simply mixing poly(N-vinylpyrrolidone) (PVP) and tannic acid (TA), resulting in strong cohesive interactions by virtue of the larger molecular size of TA and reinforced molecular interactions attributed to the presence of galloyl groups with a high density. We further analyzed the rheological and adhesive properties of PVP-TA hydrogels, revealing that it could exhibit not only a self-healing property, but also super adhesive properties with an average adhesion strength of 3.71 MPa on a glass substrate, which is > 4 times stronger than that of conventional PVP.