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Xiao-Hui Wang, Fei Song*, Dan Qian, Yao-Dong He, Wu-Cheng Nie, Xiu-Li Wang, Yu-Zhong Wang*

Center for Degradable and Flame-Retardant Polymeric Materials (ERCPM-MoE), College of Chemistry, State Key Laboratory of Polymer Materials Engineering, National Engineering Laboratory of Eco-Friendly Polymeric Materials (Sichuan), Sichuan University, 29 Wangjiang Road, Chengdu 610064, China.

* Corresponding authors: songfei520@gmail.com; yzwang@scu.edu.cn

Abstract

Suffering weak mechanical properties, hydrogels are generally limited for high load-bearing applications. Herein, chitosan and poly(acrylic acid) (PAA) are employed as double networks (DN), and metal-coordination and chain entanglement are exploited as dual crosslinks to develop fully physically crosslinked DN hydrogels. In spite of the non-covalent crosslinking, the hydrogel exhibits impressive tensile properties (3.7± 0.12 MPa) and toughness (1200 ± 50% of elongation at break and 2.8×10^3 J m^{-2} of fracture energy). In addition, good fatigue resistance and self-recovery performance are achieved for the hydrogel because of their supramolecular nature. Notably, the DN hydrogel display good self-healing property with recovered fracture stress and strain of 1.4 MPa and ~700%, respectively. The results indicate that the supramolecular design proposed in this work can bring more benefits for wide applications of hydrogel.

Key words

Double network hydrogel; Physical crosslinking; Mechanical property; Self-healing