Supporting information

Mussel-inspired post-heparinization of a stretchable hollow hydrogel tube and its potential application as an artificial blood vessel

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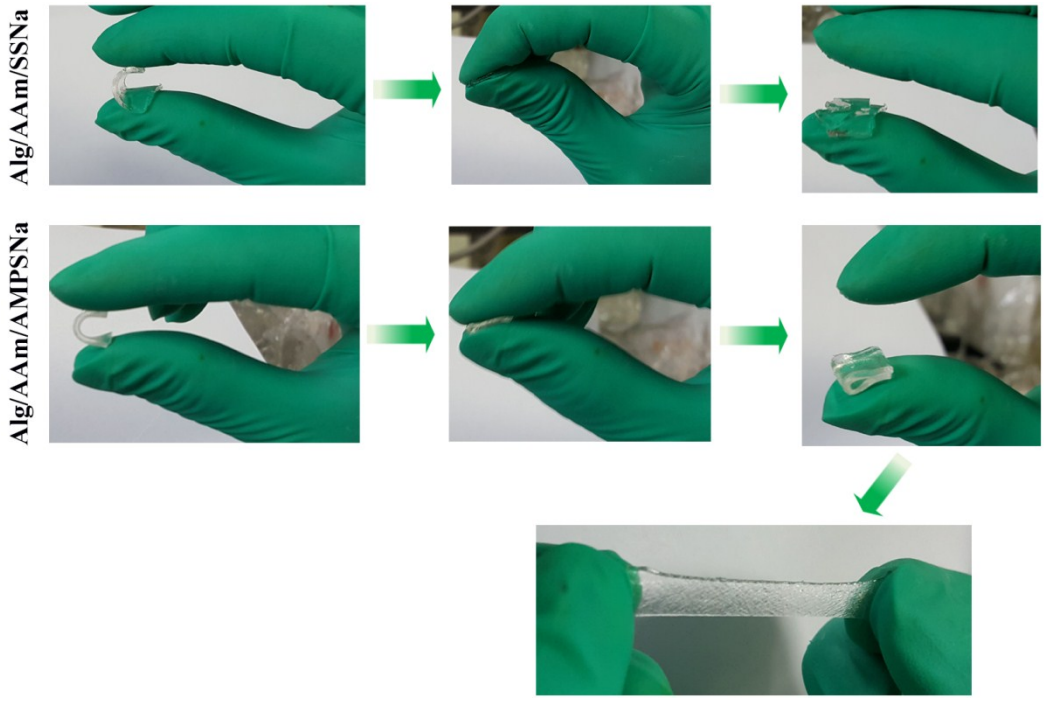

Fig. S1 Photographs of the Alg/AAm/SSNa and Alg/AAm/AMPSNa hydrogels under their original, compressed, relaxed, and stretched states. With the incorporation of rigid SSNa monomer, the hydrogel can be easily destroyed via compression.

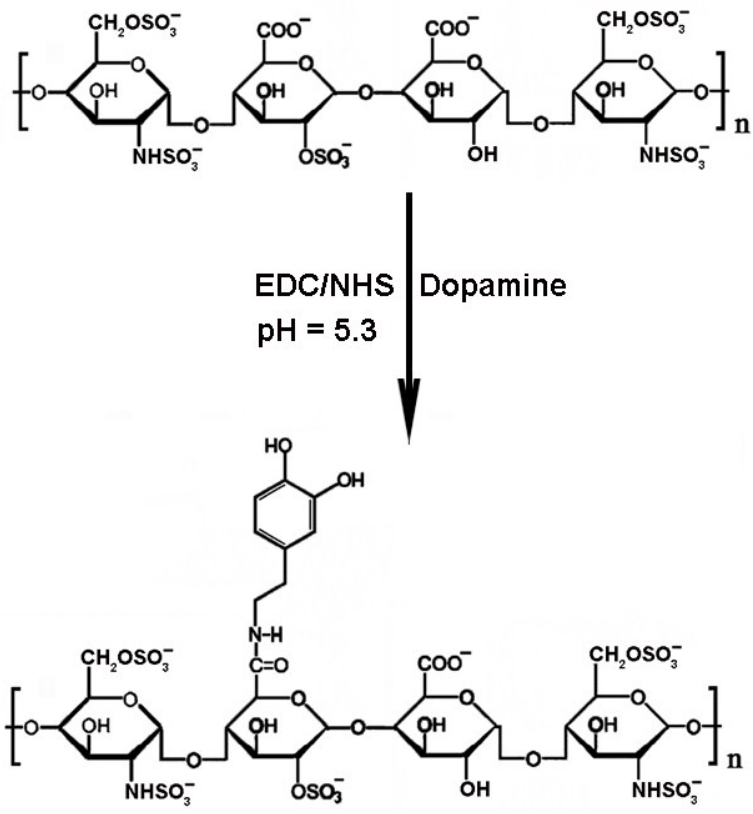

Fig. S2 Scheme for the synthesis of dopamine grafted heparin.

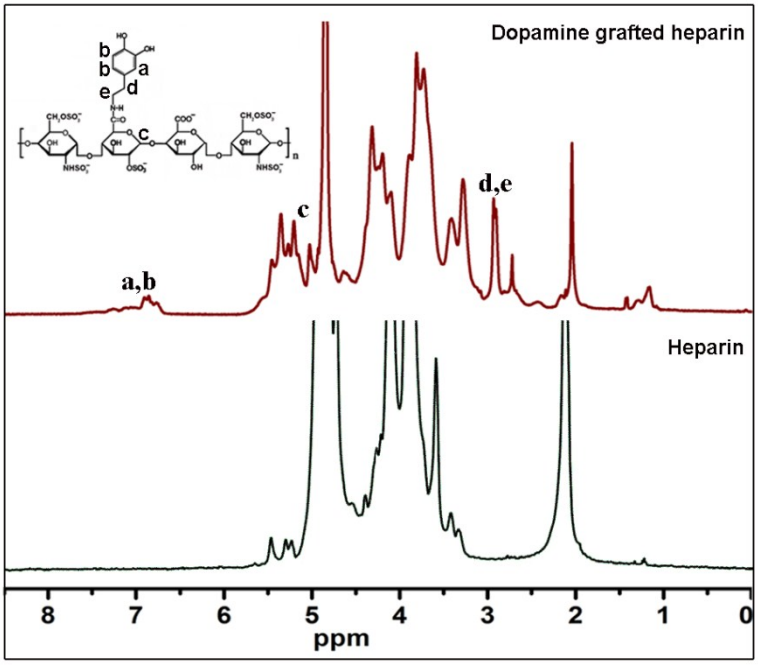

Fig. S3 ^{1}H NMR spectra of dopamine grafted heparin and heparin.

As shown in Fig. S3, the peaks between 6.50 and 7.50 ppm in the spectrum of dopamine grafted heparin were the chemical shifts of the aromatic protons on the dopamine phenyl groups. To calculate the substitution degree of dopamine, we assumed that heparin was constructed by the major sequence, and each disaccharide

repeating unit (Mw = 624 Da) had one carboxylic acid group. The grated carboxylic groups of heparin can therefore be calculated by the relative peak intensity ratio of the anomeric protons (c) in heparin (5.00–5.50 ppm) to the aromatic protons (a and b) in dopamine (6.70–7.40 ppm).[1] The calculated substitution was approximately 20% from the ^{1}H-NMR spectrum.

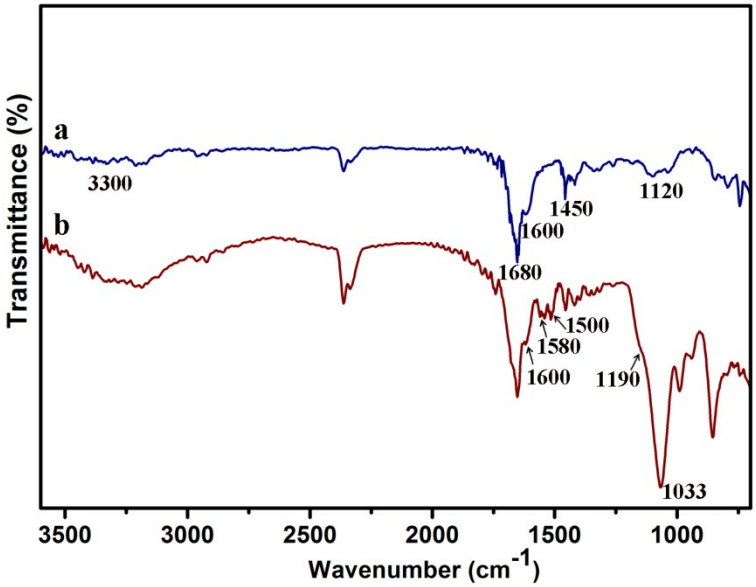

Fig. S4 FT-IR spectra of Alg/AAm (a) and Alg/AAm/Hep (b) hydrogels.

Fig. S4 shows the FT-IR spectra of the Alg/AAm and Alg/AAm/Hep hydrogels. As shown in Fig. S4a, the broad peak at 3300 cm^{-1} represented the vibrations of O-H groups in alginate. The bands at 1680 and 1600 cm^{-1} were attributed to the stretching vibration of the C=O groups bonded to the NH_2 groups. After being anchored with dopamine grafted heparin, as shown in Fig. S4b, newly formed peaks at around 1500, 1580, and 1600 cm^{-1} were observed, which should be attributed to the stretching vibration of the C=C bonds within the benzene of the dopamine after anchoring. While the peak for the stretching vibration of C=O groups conjugated with the C=C bonds in the oxidized dopamine was overlapped with the peak for benzene at 1580 cm^{-1}. Moreover, the strong bands at 1190 and 1033 cm^{-1} were the asymmetric valence vibrations and the symmetric stretching vibrations of the highly polar $-SO_3^-$ groups of heparin, respectively.[1]

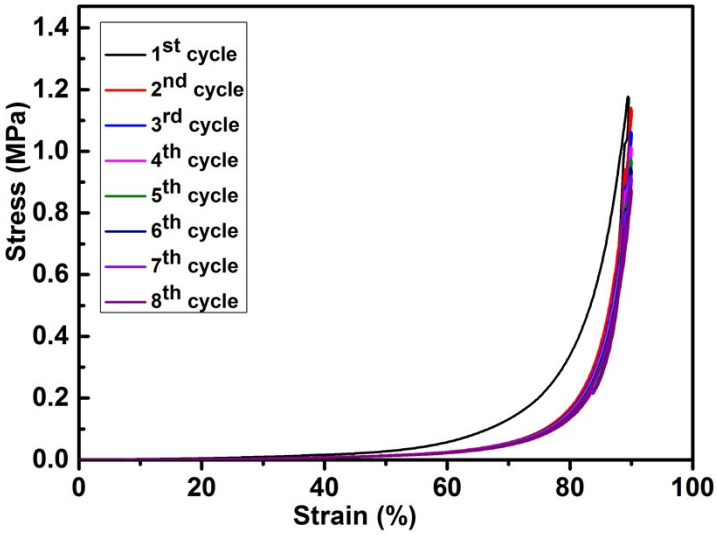

Fig. S5 cyclic compression test of Alg/AAm/Hep hydrogel.

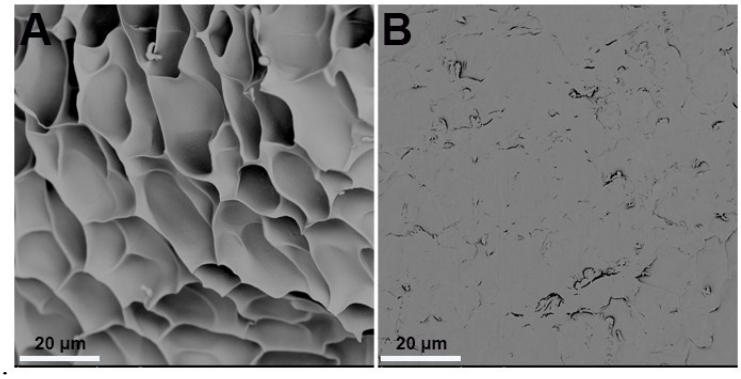

Fig. S6 Cross-section (A) and surface (B) SEM images of Alg/AAm DN hydrogel after being equilibrated in water.

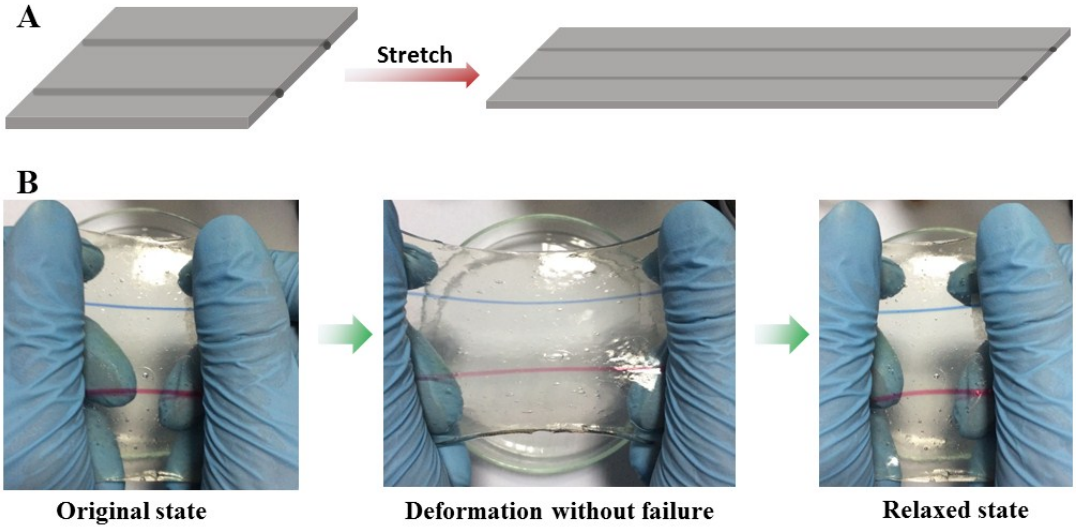

Fig. S7 Illustration of the hydrogel with channels and its stretched state (A); Photographs of original, stretched, and relaxed states of the dyes injected

multichannel hydrogel (B).

Reference

1. C. Cheng, S. Li, S. Nie, W. Zhao, H. Yang, S. Sun and C. Zhao, Biomacromolecules, 2012, 13, 4236-4246.