Electronic Supplementary Material (ESI) for Soft Matter.

Supporting Information

Extremely Stretchable and Tough Hybrid Hydrogels Based on Gelatin, κ-Carrageenan and Polyacrylamide

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Supplementary figures

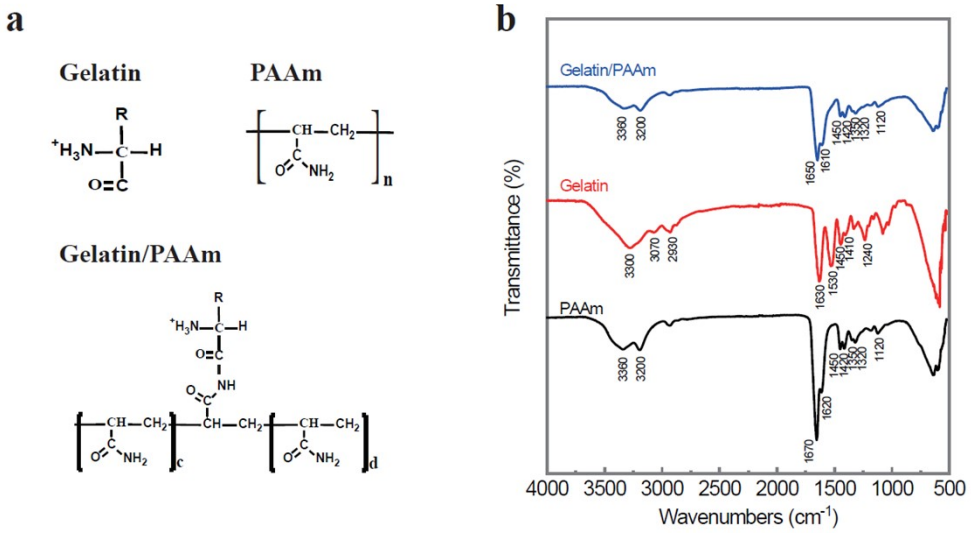

Fig. S1 (a) Chemical structure of gelatin, PAAM and gelatin/PAAm. (b) ATR-IR spectra of PAAm, gelatin/PAAm, gelatin/κ-carrageenan/PAAm gels.

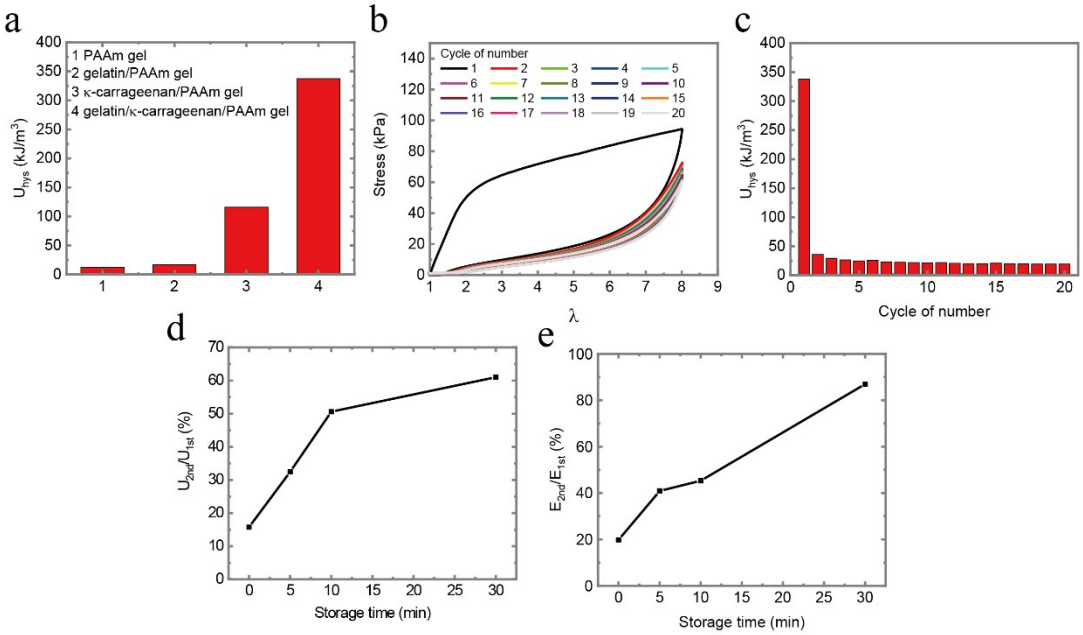

Fig. S2 (a) Dissipated energies of PAAm gel, gelatin/PAAm gel, κ-carrageenan/PAAm gel and gelatin/κ-carrageenan/PAAm gel. (b) 20 successive cyclic tensile loops of gelatin/κ-carrageenan/PAAm gel with λ=8 without waiting time and (c) corresponding dissipated energy of each loop. Recovery percentage of gelatin/κ-carrageenan/PAAm gels denoted by the ratios of (d) energy dissipation and (e) elastic modulus of the second loading-unloading cycle to that of original loading-unloading cycle as a function of duration time.

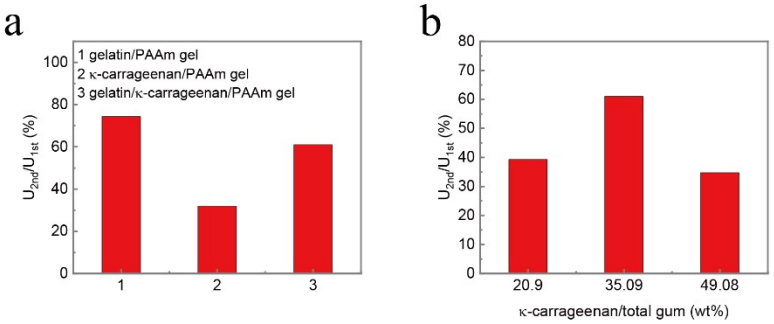

Fig. S3 (a) Recovery percentage of gelatin/PAAm gel, κ-carrageenan/PAAm gel and gelatin/κ-carrageenan/PAAm gel. (b) Recovery percentage of gelatin/κ-carrageenan/PAAm gel of various fractions of κ-carrageenan to the total gum (20.9, 35.09, 49.08 wt%).

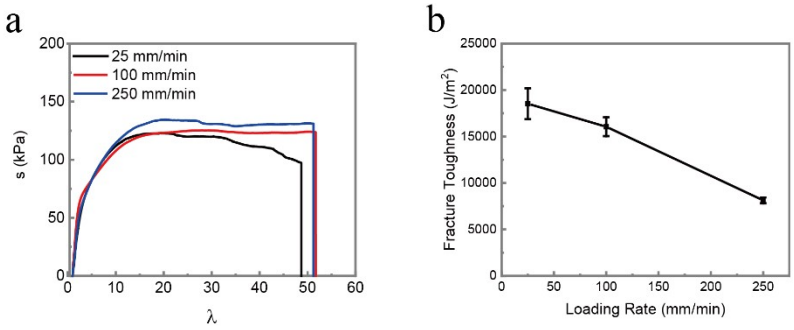

Fig. S4 (a) Stress-stretch curves of gelatin/κ-carrageenan/PAAm gels at various loading rates. (b) Fracture toughness as a function of the loading rate.

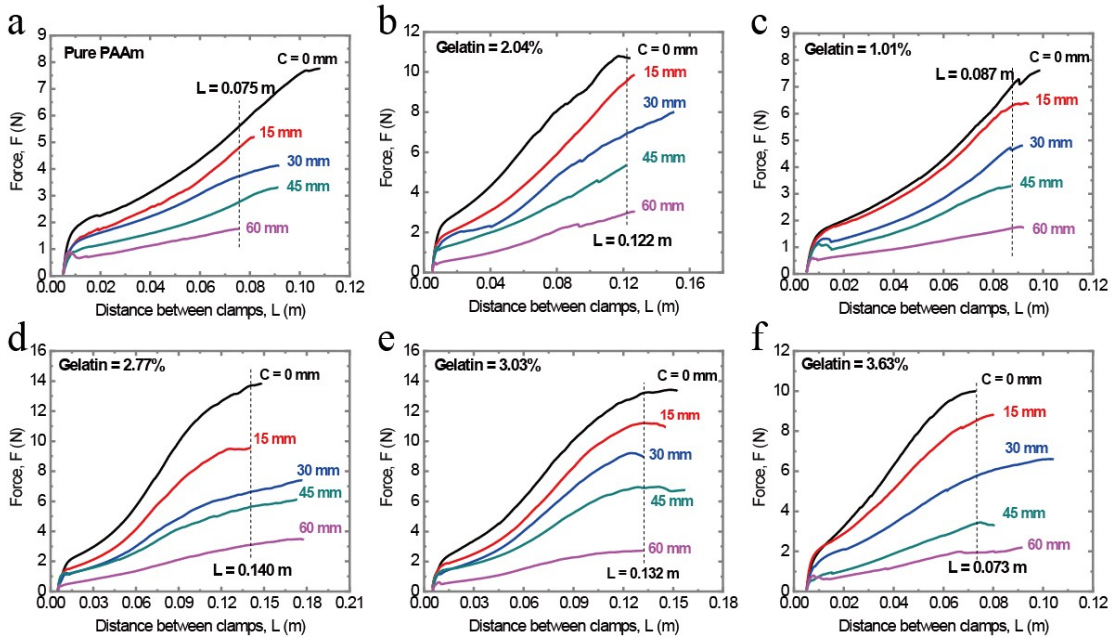

Fig. S5 Force-extension curves for various initial crack sizes. An edge crack was introduced to gelatin-PAAm gel samples with various concentration of gelatin (w/v, v is the volume of water). (a) 0%, (b) 1.01%, (c) 2.04%, (d) 2.77%, (e) 3.03%, (f) 3.63%.

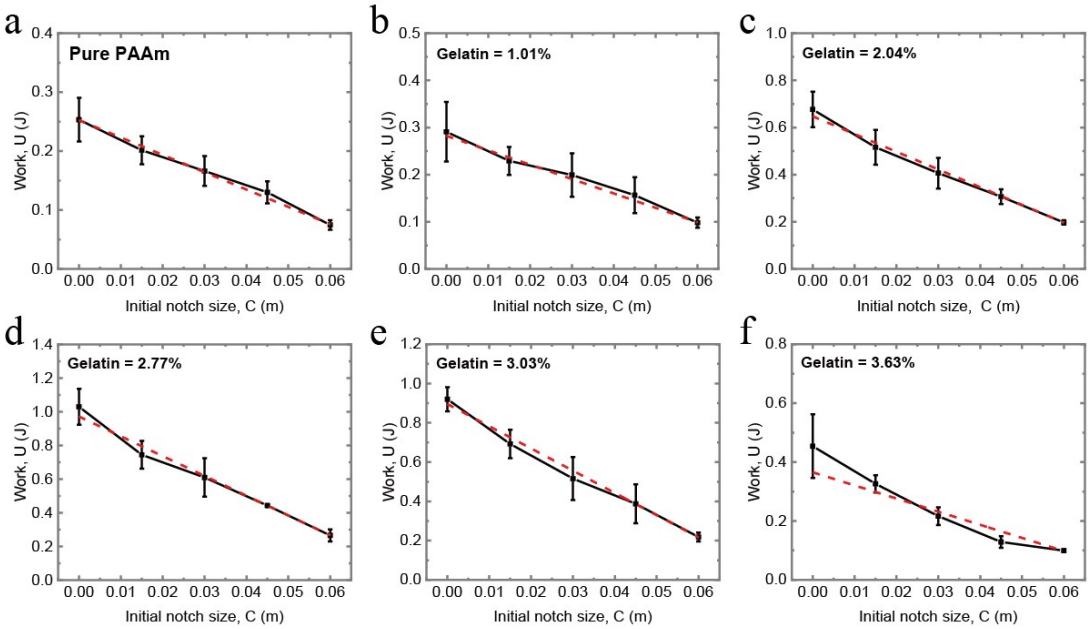

Fig S6 The work, U, done in deforming gelatin/PAAm gel samples with various initial crack sizes with various concentration of gelatin (w/v, v is the volume of water). (a) 0%, (b) 1.01%, (c) 2.04%, (d) 2.77%, (e) 3.03%, (f) 3.63%.

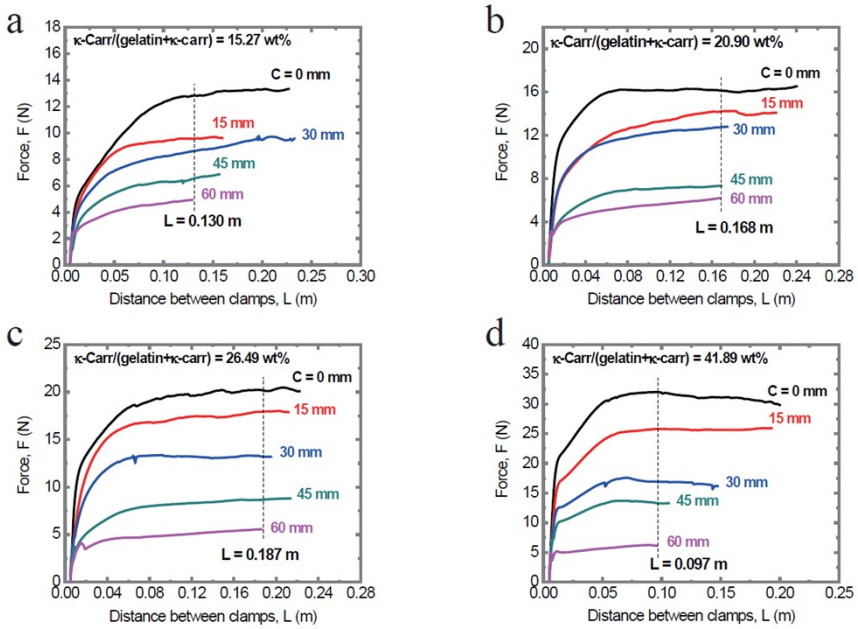

Fig. S7 Force-extension curves for various initial crack sizes. An edge crack was introduced to gelatin/PAAm gel samples with various fractions of κ-carrageenan to the total gum (a) 15.27 wt%, (b) 20.90 wt%, (c) 26.49 wt%, (d) 41.89 wt%.

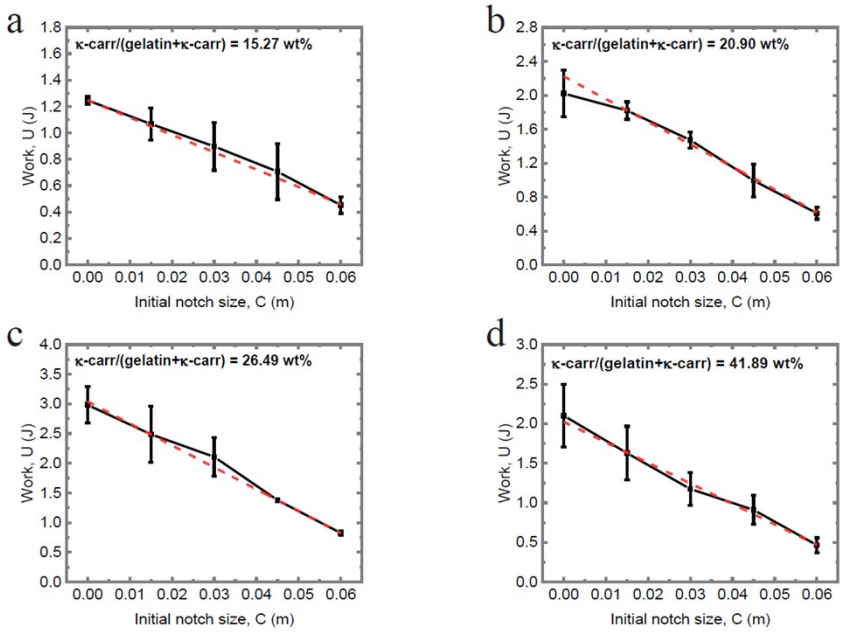

Fig. S8 The work, U, done in deforming gelatin/κ-carrageenan/PAAm gel samples with various initial crack sizes with various fractions of κ-carrageenan to the total gum (a) 15.27 wt%, (b) 20.90 wt%, (c) 26.49 wt%, (d) 41.89 wt%.