Supporting Information

Puncture-resistant hydrogels with high mechanical performance achieved by the supersaturated salt

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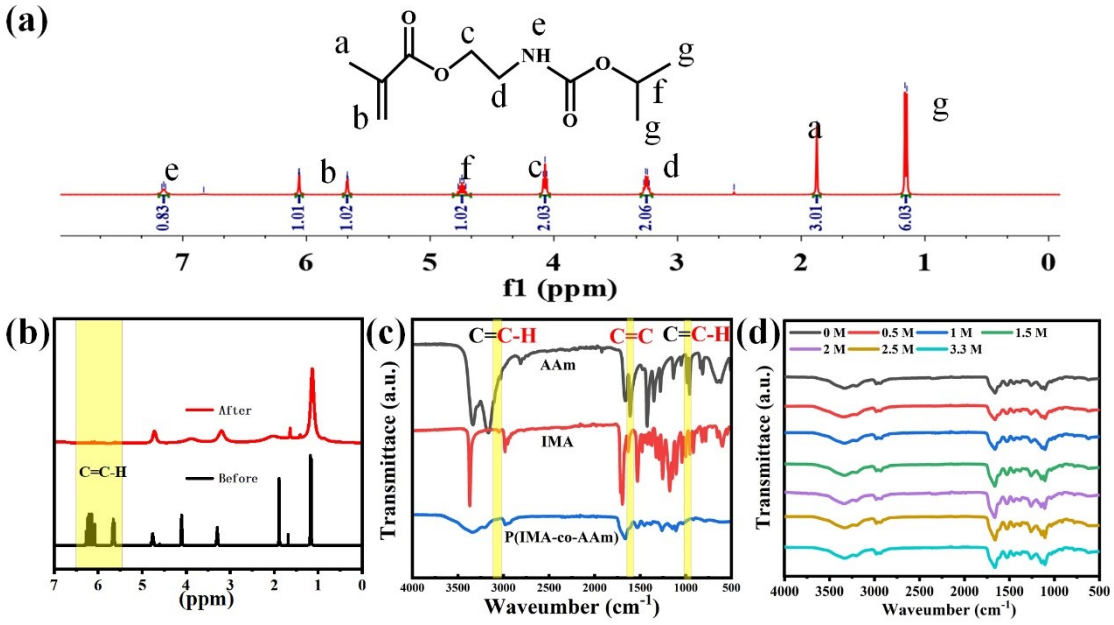

Fig S1. (a) ^{1}H NMR spectrum of IMA, (b) ^{1}H NMR and (c) ATR-FTIR spectra of monomers and hydrogel, (d)ATR-FTIR spectra of P(IMA1-co-AAm1.5)-Na_2SO_4-*x* hydrogels (*x* is 0 M, 0.5 M, 1 M, 1.5 M, 2 M, 2.5 M, and 3.3 M).

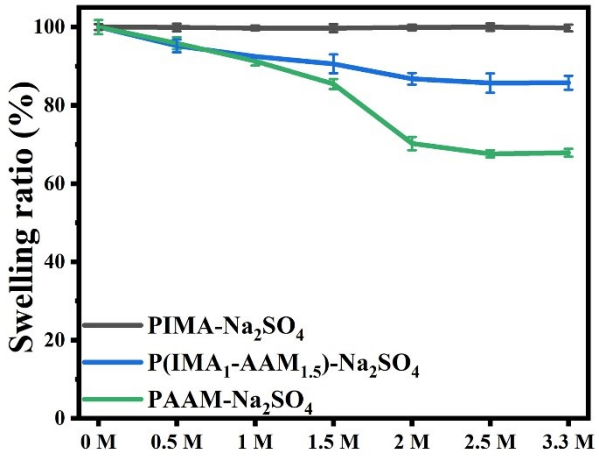

Fig S2. Swelling ratio of PIMA-Na_2SO_4, P(IMA_1-co-$AAm_{1.5}$)-Na_2SO_4, PAAm-Na_2SO_4 hydrogels prepared in Na_2SO_4 solutions with different concentrations.

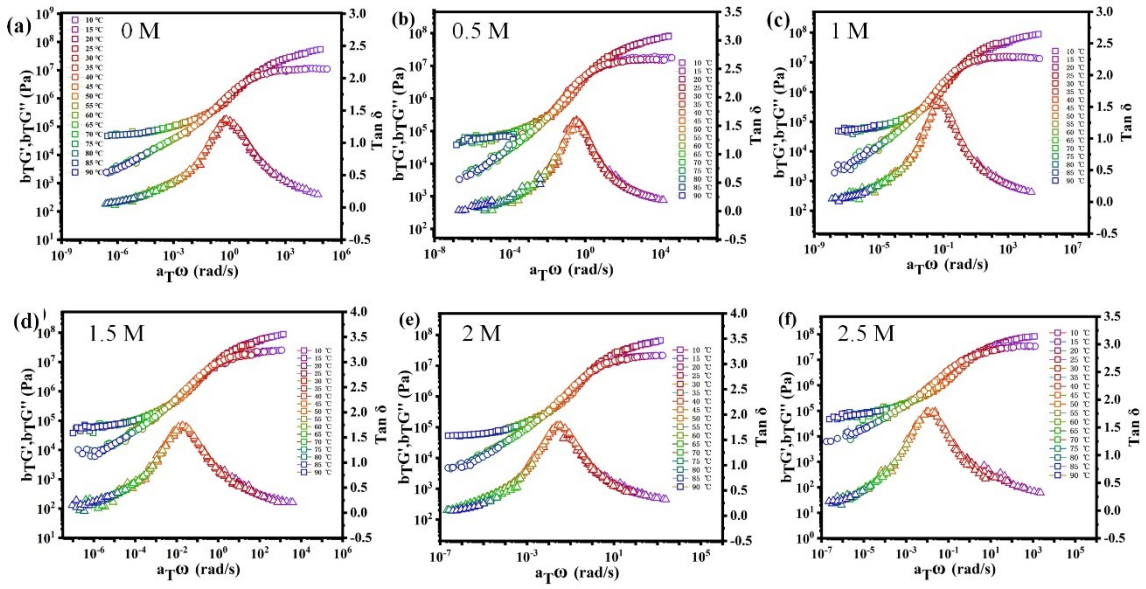

Fig S3. Spectra of storage modulus (G′), loss modulus (G″), and loss factor (tanδ) of P(IMA$_1$-co-AAm$_{1.5}$) hydrogels immersed in (a) 0 M, (b) 0.5 M, (c) 1 M, (d) 1.5 M, (e) 2 M, (f) 2.5 M, and (g) 3.3 M sodium sulfate solutions.

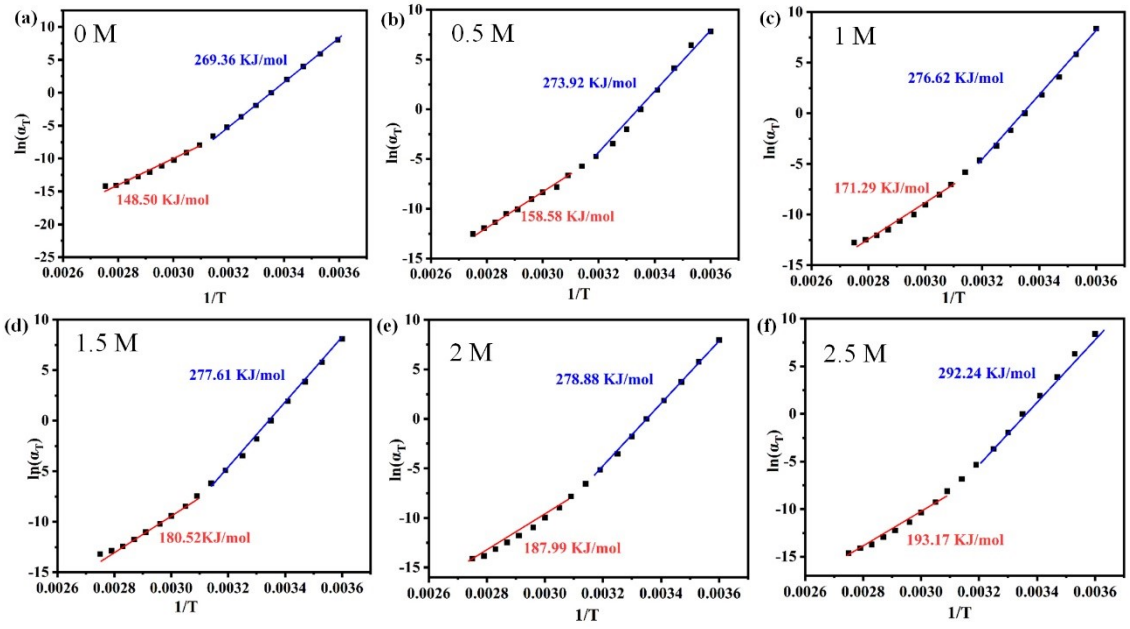

Fig S4. Plot of ln(a$_T$) vs. 1/T of P(IMA$_1$-co-AAm$_{1.5}$) hydrogels immersed in (a) 0 M, (b) 0.5 M, (c) 1 M, (d) 1.5 M, (e) 2 M, (f) 2.5 M, and (g) 3.3 M sodium sulfate solutions following TTS.

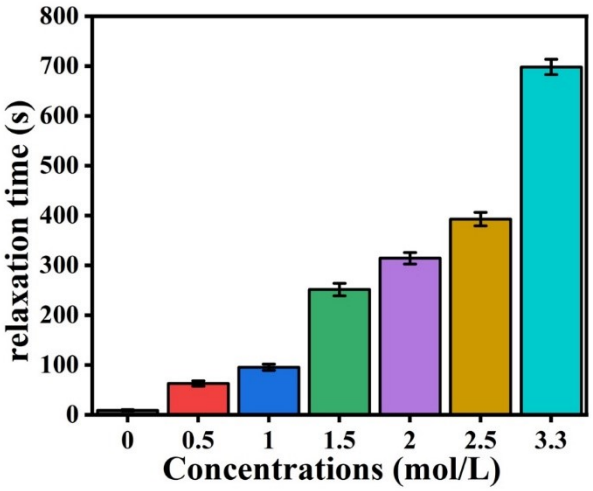

Fig S5. Relaxation time of different P(IMA$_1$-co-AAm$_{1.5}$)-Na_2SO_4-*x* hydrogels (*x* is 0 M, 0.5 M, 1 M, 1.5 M, 2 M, 2.5 M, and 3.3 M).

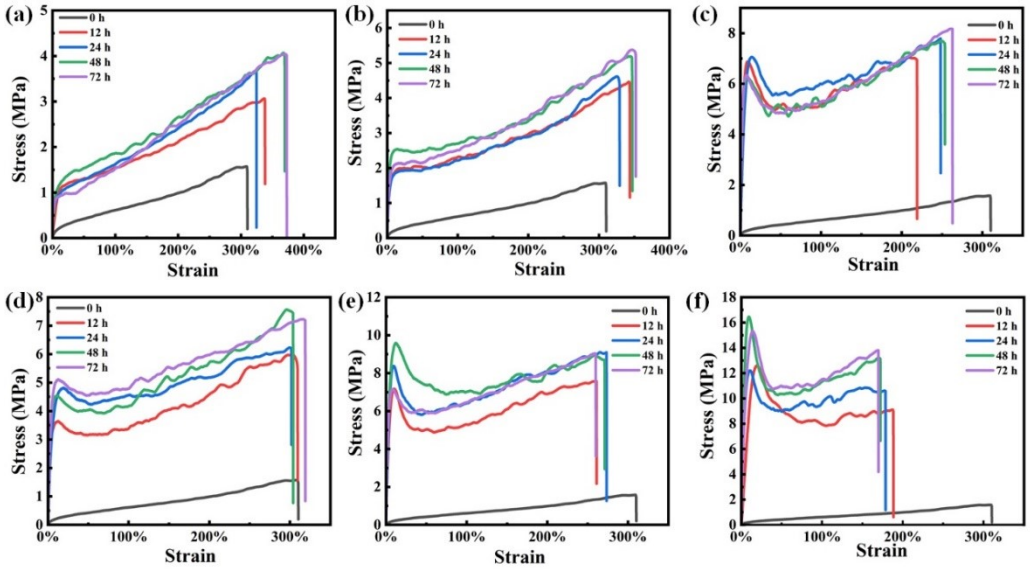

Fig S6. Tensile stress-strain curves of P(IMA$_1$-co-AAm$_{1.5}$) hydrogel immersed in (a) 0.5 M, (b) 1 M, (c) 1.5 M, (d) 2 M, (e) 2.5 M, and (f) 3.3 M Na_2SO_4 solutions for different soaking times.

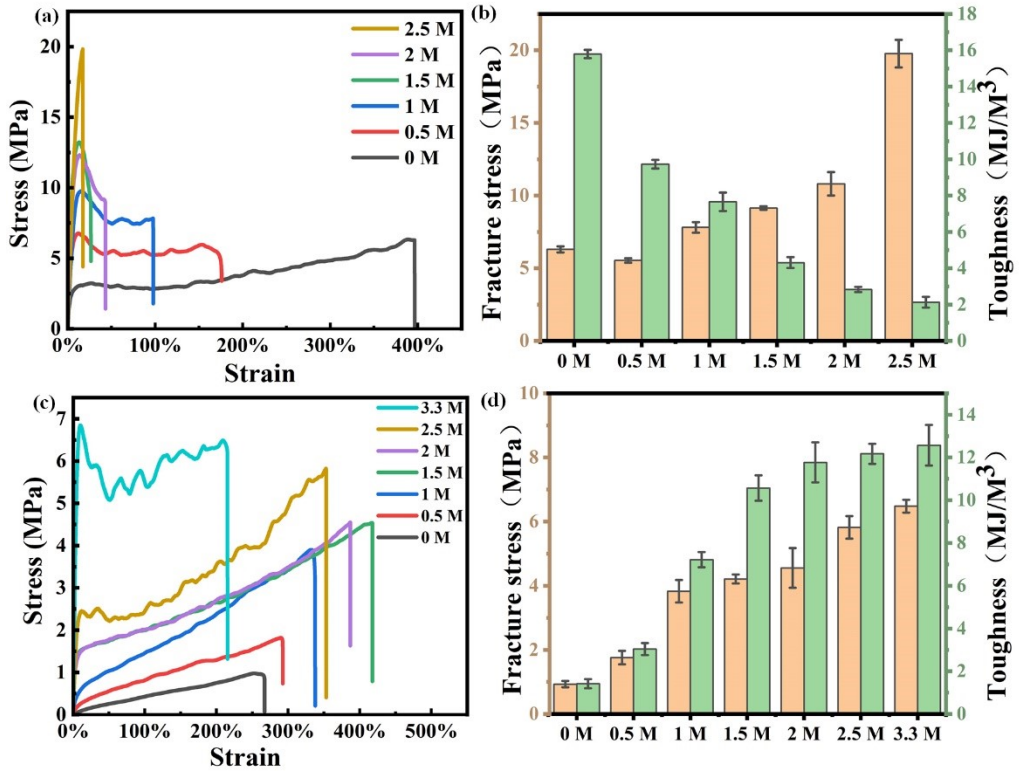

Fig S7. Tensile stress-strain curves and fracture stress and toughness of (a,b) P(IMA_1-co-AAm_1)-Na_2SO_4-*x* and (c,d) P(IMA_1-co-AAm_2) -Na_2SO_4-*x* hydrogels. (*x* is 0 M, 0.5 M, 1 M, 1.5 M, 2 M, 2.5 M, and 3.3 M).

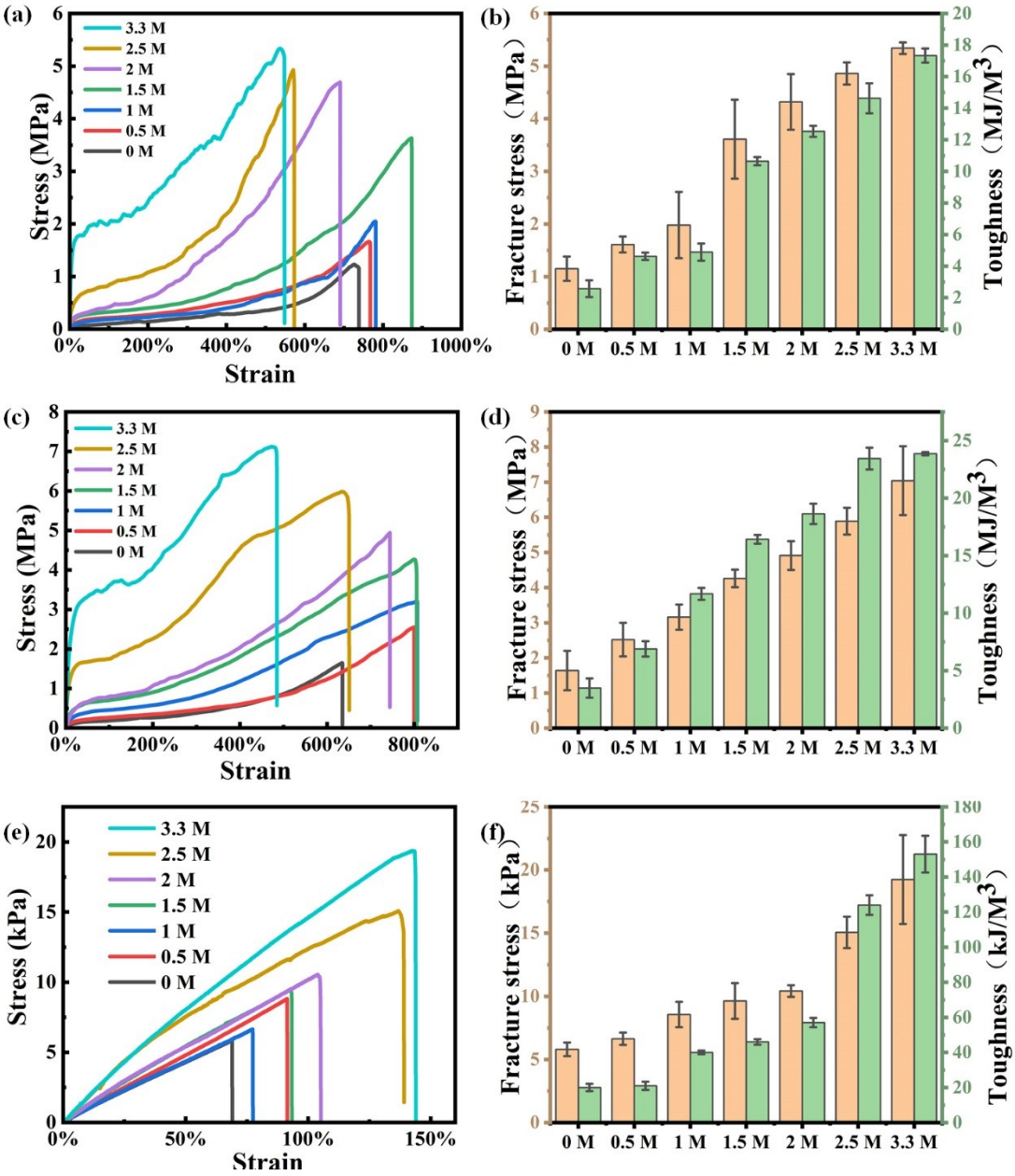

Fig S8. Tensile stress-strain curves and fracture stress and toughness of (a,b) P(BA_1-co-AAm_1)-Na_2SO_4-*x*, (c,d) P($2EA_1$-co-AAm_1) -Na_2SO_4-*x* hydrogels, (e,f) PAAm-Na_2SO_4-*x* hydrogels. (*x* is 0 M, 0.5 M, 1 M, 1.5 M, 2 M, 2.5 M, and 3.3 M).

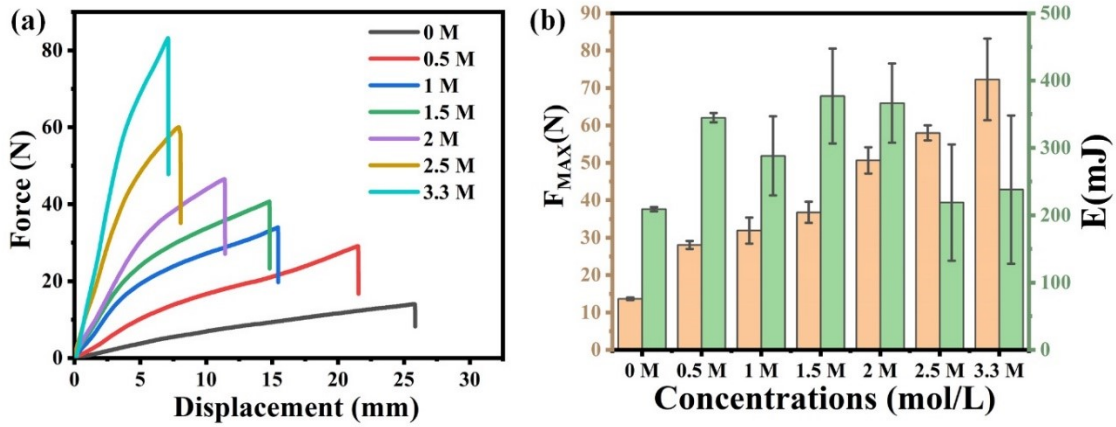

Fig S9. (a) Puncture force-displacement curves, and (b) the maximum puncture force (F_{max}) and energy to puncture (E) for P(IMA$_1$-co-AAm$_{1.5}$)-Na$_2$SO$_4$-x hydrogels. (x is 0 M, 0.5 M, 1 M, 1.5 M, 2 M, 2.5 M, and 3.3 M) (needle diameter 4 mm; speed of 50 mm/min).

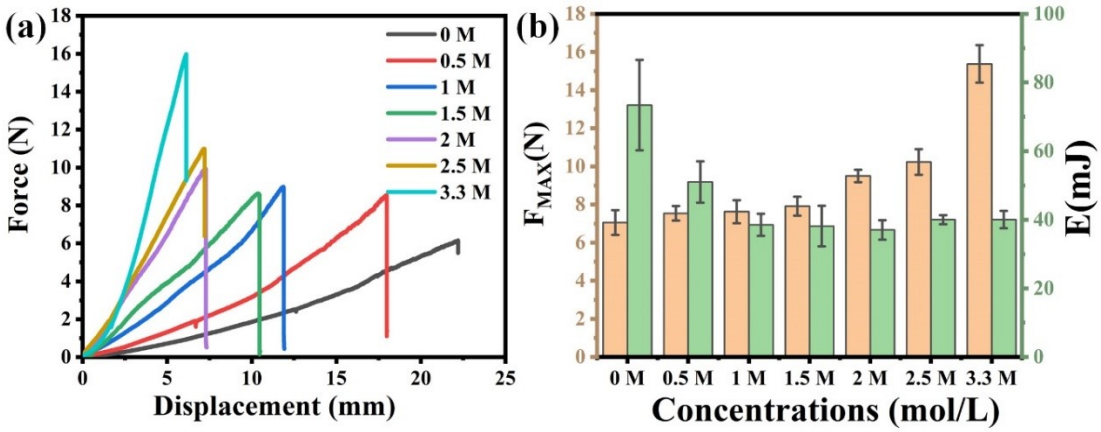

Fig S10. (a) Puncture force-displacement curves, and (b) the maximum puncture force (F_{max}) and energy to puncture (E) for P(IMA$_1$-co-AAm$_{1.5}$)-Na$_2$SO$_4$-x hydrogels. (x is 0 M, 0.5 M, 1 M, 1.5 M, 2 M, 2.5 M, and 3.3 M) (needle diameter 1 mm; speed of 0.6 mm/min).