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In-situ polymerization induced supramolecular hydrogels of chitosan and poly(acrylic acid-acrylamide) with high toughness

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Results and discussion

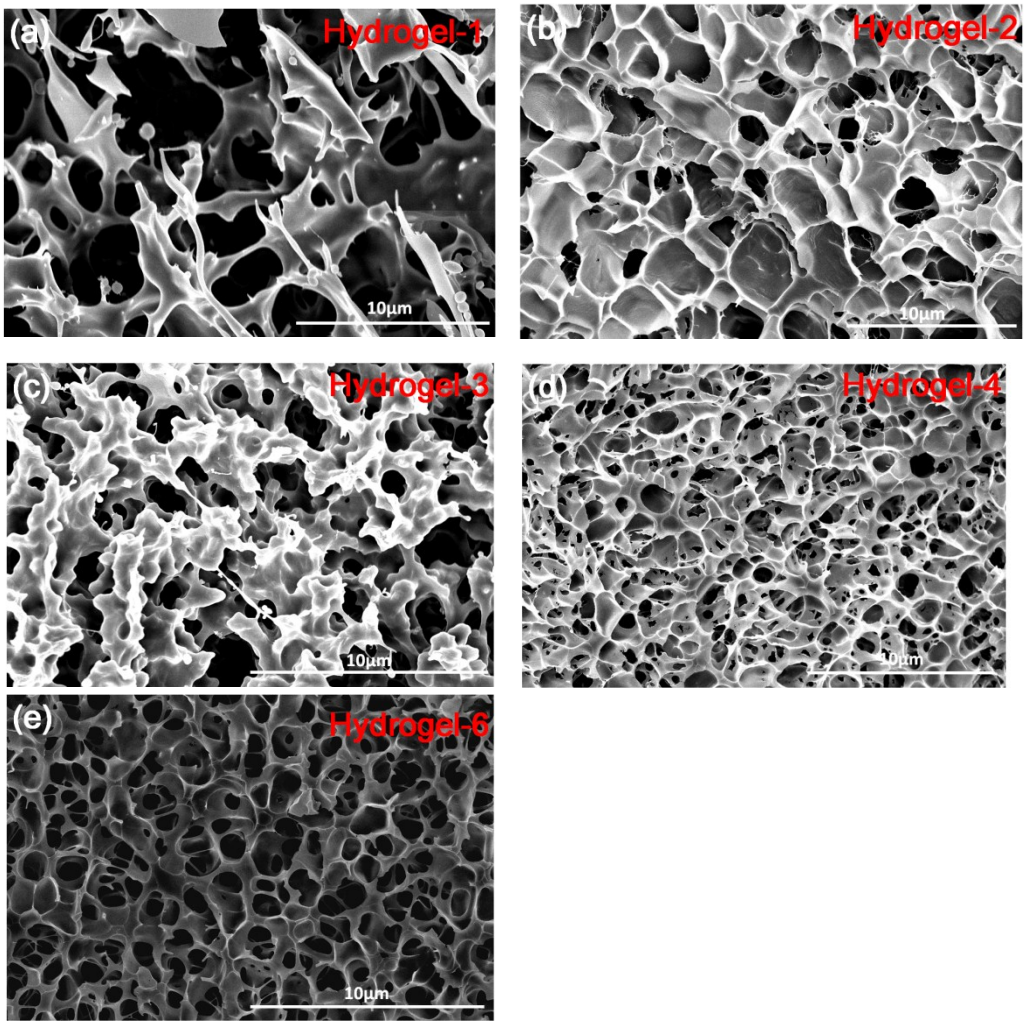

Figure S1. The cross-section surface morphology of the obtained hydrogels. Representative SEM images of cross-section surface morphology of (a) hydrogel-**1**, (b) hydrogel-**2**, (c) hydrogel-**3**, (d) hydrogel-**4**, (e) hydrogel-**6**.

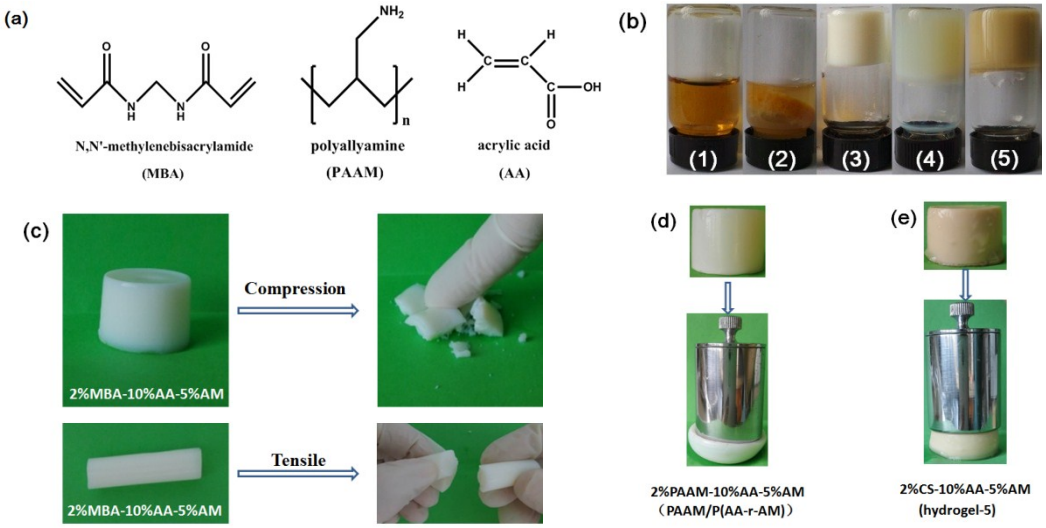

Figure S2. Control experiments. (a) Chemical structure of component used in control tests; (b) Digital photographs of controlled gel-formation tests, (1) 2% CS-10% HAc - 5% AM, (2) 2% CS - 10% AA, (3) 2% MBA - 10% AA - 5% AM, (4) 2% PAAM - 10% AA - 5% AM (PAAM/P(AA-*r*-AM)), (5) 2% CS - 10% AA - 5% AM (hydrogel-**5**); (c) Compressive and tensile experiments of chemical P(AA-*r*-AM) hydrogel using MBA as cross-linker; (d) Digital photograph of 2% PAAM -10%AA- 5%AM (PAAM /P (AA -*r*-AM)) hydrogel withstand a certain weight;(e) Digital photograph of 2% CS - 10 % AA - 5% AM (hydrogel-**5**) hydrogel withstand a certain weight.

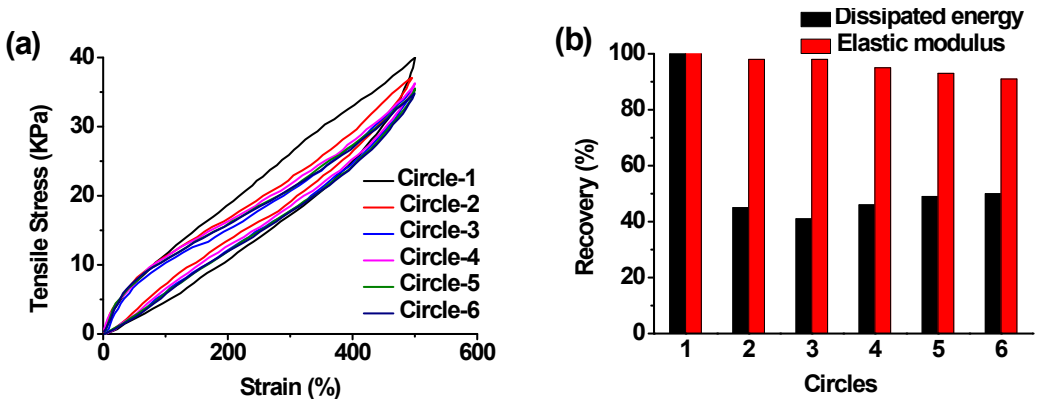

Figure S3. Loading-unloading cycling tests of hydrogel-**4**. (a) Six successive loading-unloading cycles of the hydrogel-**4**; (b) the recovery of elastic modulus and hysteresis loop area calculated from (a).

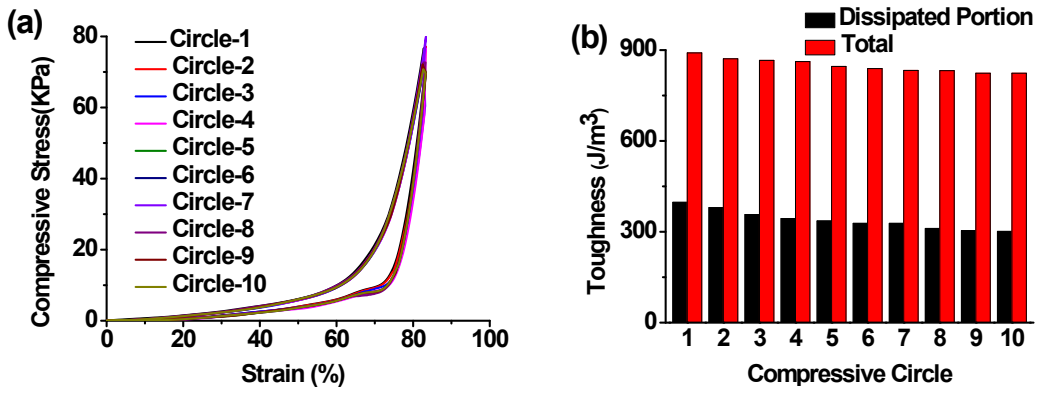

Figure S4. Fatigue resistance of hydrogel-**4**.Cycle compression test of hydrogel-**4** undergoing 10 cycles of compression to 80% strain (a); (b) the caculated total toughness and the dissipated toughness of hydrogel-**4** during loading-unloading tests based on (a).

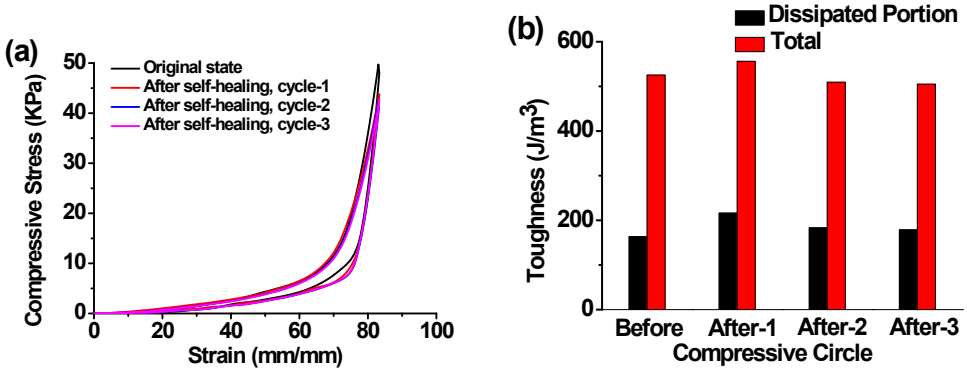

Figure S5. Self-healing property. (a) Cycle compression tests of hydrogel-**5** of compression to 80 % strain before self-healing and undergoing 3 cycles after healed for 24 h. (b) the calculated total toughness and the dissipated toughness of hydrogel-**5** before self-healing and after self-healing based on (a).

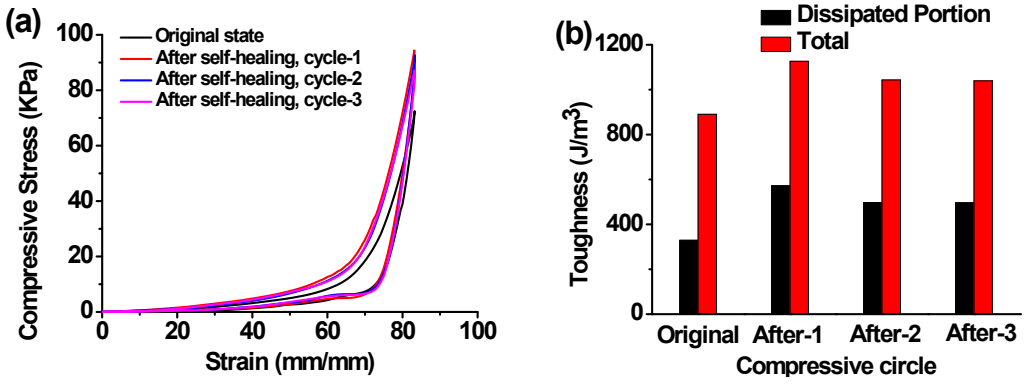

Figure S6. Self-healing properity. (a) Cycle compression tests of hydrogel-**4** of compression to 80%

strain before self-healing and undergoing 3 cycles after healed for 24h. (b) the caculated total toughness and the dissipated toughness of hydrogel-**4** before self-healing and after self-healing based on (a).

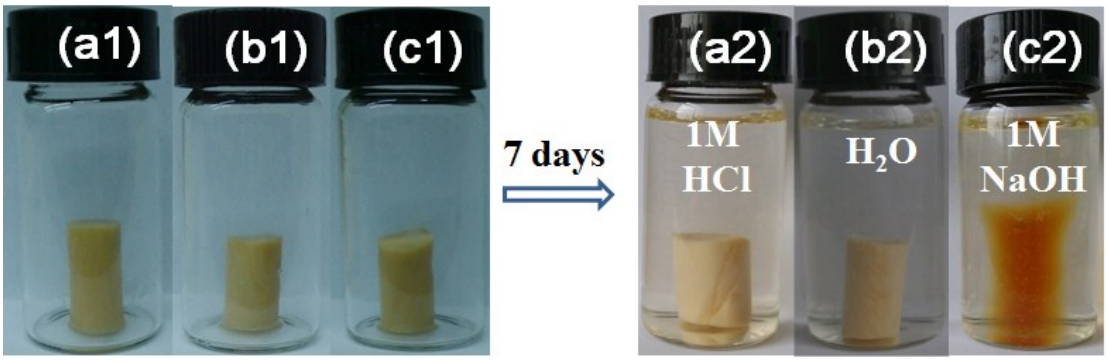

Figure S7. Stability of the hydrogel-**5.** Digital photographs of hydrogel-**5** before and after swelling in acidic and alkaline conditions.

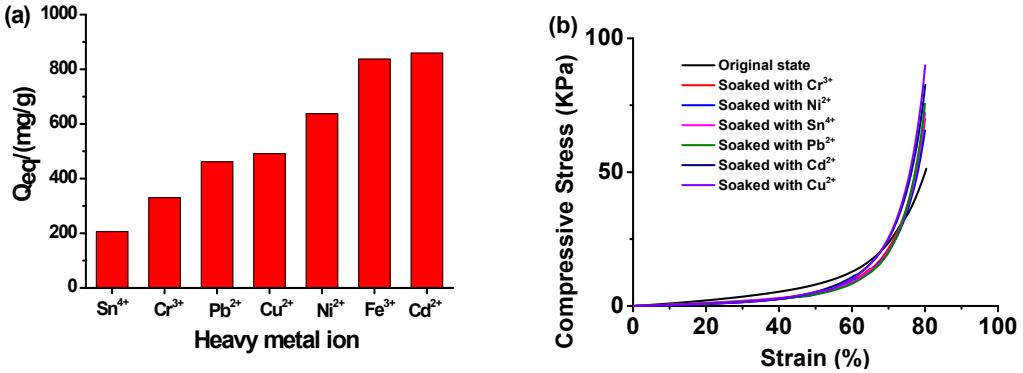

Figure S8. (a) Saturated adsorption capacities of hydrogel-**5** for seven metal ions, (b) the compression tests of hydrogel-**5** soaked in different metal ions' solution(c=0.001mol/L).