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Mechanical, adhesive and self-healing ionic liquid hydrogels for electrolytes and flexible strain sensors

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The tests of mechanical properties were conducted at room temperature. And the hydrogel specimen was set as dumbbell-shape. And the length, width and thickness of hydrogel specimen were 30 mm, 3 mm and 3 mm, respectively. The speed of tension machine was set as 100 mm/min. During peeling characterization, the angle and speed of texture analyzer were set as 90° and 5 mm/min, respectively. In the characterization procedure of **electrical characterization**, the four-probe AC was employed, and the impedance spectrum frequency ranged from 1×10^{-1} Hz to 1×10^{2} Hz.

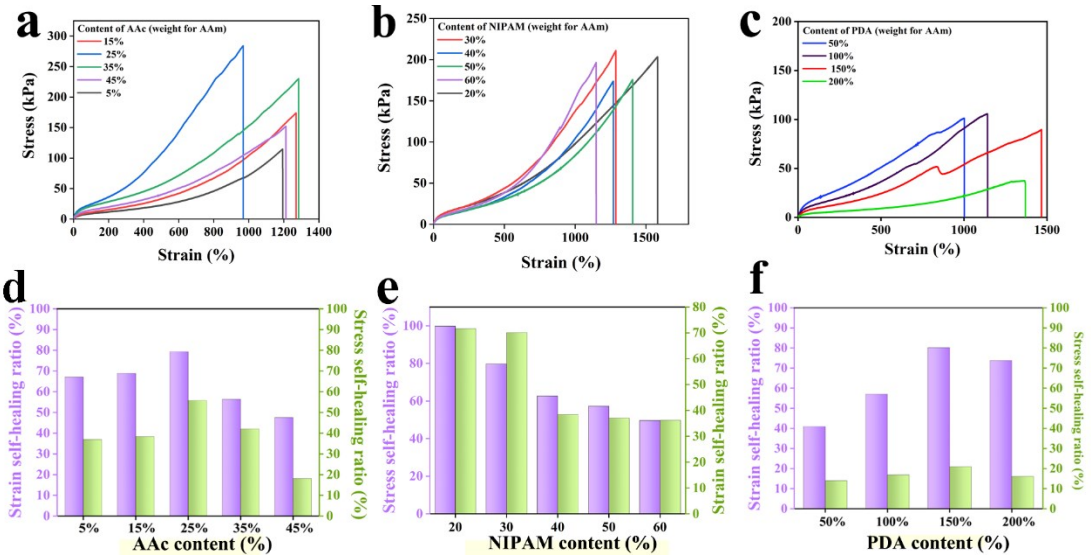

Figure S1. Tensile stress-strain curve of self-healing HPAAN/PDA hydrogel samples with different content of (c) AAc, (d) NIPAM, (e) PDA; (f-h) the corresponding self-healing efficiency was calculated according to (a-c).

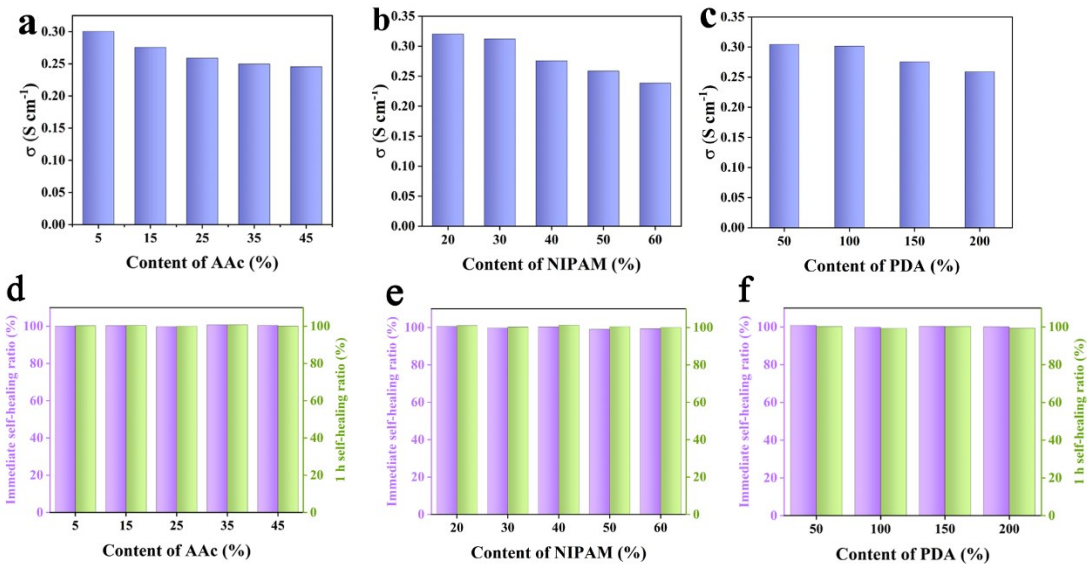

Figure S2. Conductivity of HPAAN/PDA hydrogel changing with the content of (a) AAc, (b) NIPAM, (c) PDA; (d-f) the corresponding self-healing efficiency was calculated according to (a-c).

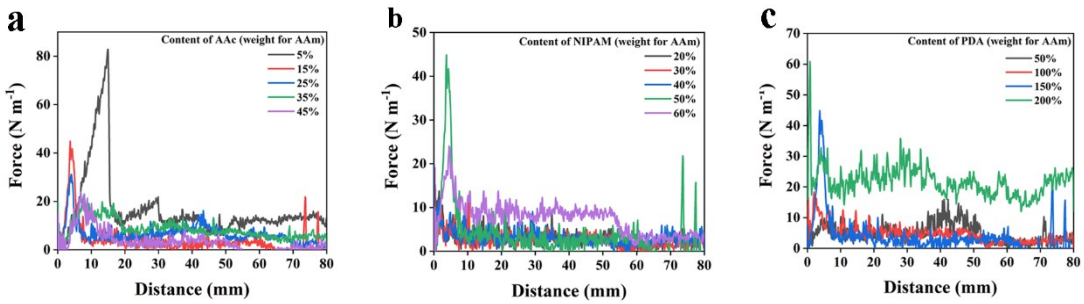

Figure S3. Adhesion between HPAAN/PDA hydrogel and aluminum matrix changing with the content of (i) AAc, (j) NIPAM, (k) PDA.

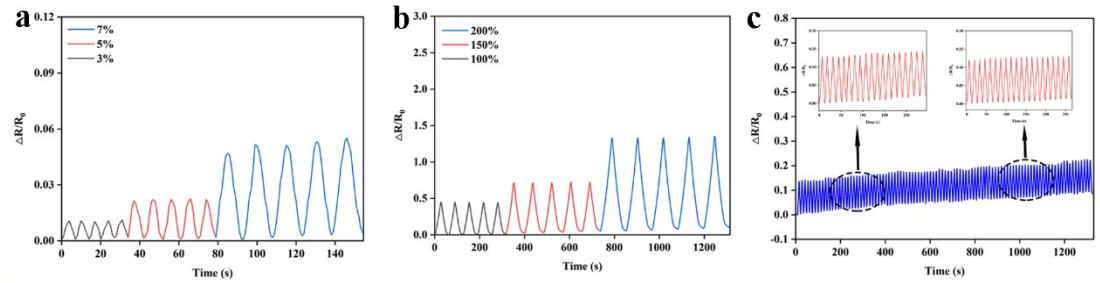

Figure S4. $\Delta R/R_0$ change with (a) strain of 3%, 5%, 7% cyclic loading-unloading tests (3 times); (b) strain of 100%, 150%, 200% cyclic loading-unloading tests (3 times); (c) $\Delta R/R_0$ change with strain of 20% (100continuously cyclic tests).