## **Supporting Information**

## Cartilage-inspired hydrogel strain sensors with ultrahigh toughness,

## good self-recovery and stable anti-swelling

Jiajun Xu, Rining Jing, Xiuyan Ren\*, Guanghui Gao\*

Polymeric and Soft Materials Laboratory, School of Chemical Engineering and Advanced Institute of Materials Science, Changchun University of Technology, Changchun 130012, China Corresponding Authors: Xiuyan Ren; Guanghui Gao E-mail: xyren\_bio@163.com (X. Ren); ghgao@ccut.edu.cn (G. Gao)

Hydrogels	CTAC	NaCl	H <sub>2</sub> O	HMA	AA	AAm	CS	KPS
	g	g	mL	ml	mL	g	g	g
CS (0.00wt%)	0.8	0.4	20	0.1	1	5.0	0.0	0.02
CS (1.67wt%)	0.8	0.4	20	0.1	1	4.9	0.1	0.02
CS (3.33wt%)	0.8	0.4	20	0.1	1	4.8	0.2	0.02
CS (5.00wt%)	0.8	0.4	20	0.1	1	4.7	0.3	0.02
CS (6.67wt%)	0.8	0.4	20	0.1	1	4.6	0.4	0.02

Table S1 Recipes for resigned hydrogel samples



Figure S1 The solid content of HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogels for different soaking times.



**Figure S2** The pH value of the water matrix in the HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogels for different soaking times.



**Figure S3** (a) Conductivity of the HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogels after it has been stabbed; (b) Conductivity of the HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogels after it has been cut.



**Figure S4** (a) Tensile cycling curves of, and (b) corresponding stress and hysteresis energy of HP(AAm/AA)-CS hydrogels, HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogels (Original) and HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogels (soaked 24 h in water), respectively.



**Figure S5** (a) Conductive properties of HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogel for different water loss time at room temperature; the relative resistance changes for the HP(AAm/AA)-CS-Fe<sup>3+</sup> hydrogel after different water loss time at room temperature: (b) 0 h, (c) 1 h, (d) 3 h, (e) 5 h, (f) 7 h.