Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.


# Novel Electric-Conductive Electro-Responsive Hydrogels for Smart Actuators with Unique Three-Dimensional CNTs-Enriched Conductive Network and Physical-Phase Interpenetrating Network

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## SUPPORTING INFORMATION

**Table S1** comparison on mole fractions of the AA and AMPS segments within P(AMPS-co-AA) for four as-polymerized samples.

| Sample | $C_{AA}$ (%) | $C_{AMPS}$ (%) | $F_{AA}$ (%) | $F_{AMPS}$ (%) |
|---|---|---|---|---|
| Pure P(AMPS-co-AA) | 93.5 | 87.0 | 90.6 | 9.4 |
| P(AMPS-co-AA)/NF | 88.2 | 78.3 | 91.0 | 9.0 |
| P(AMPS-co-AA)/Na-MMT | 96.7 | 91.3 | 90.5 | 9.5 |
| P(AMPS-co-AA)/CNT | 94.4 | 96.7 | 89.8 | 10.2 |

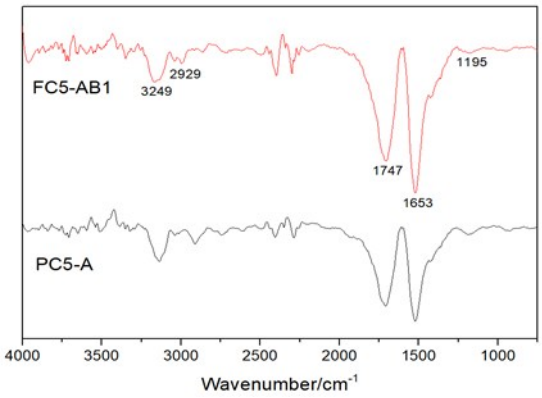
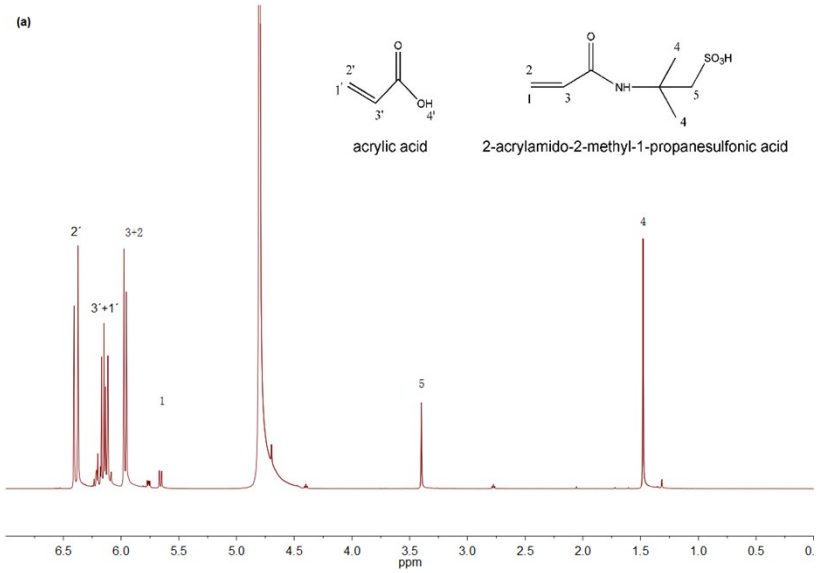
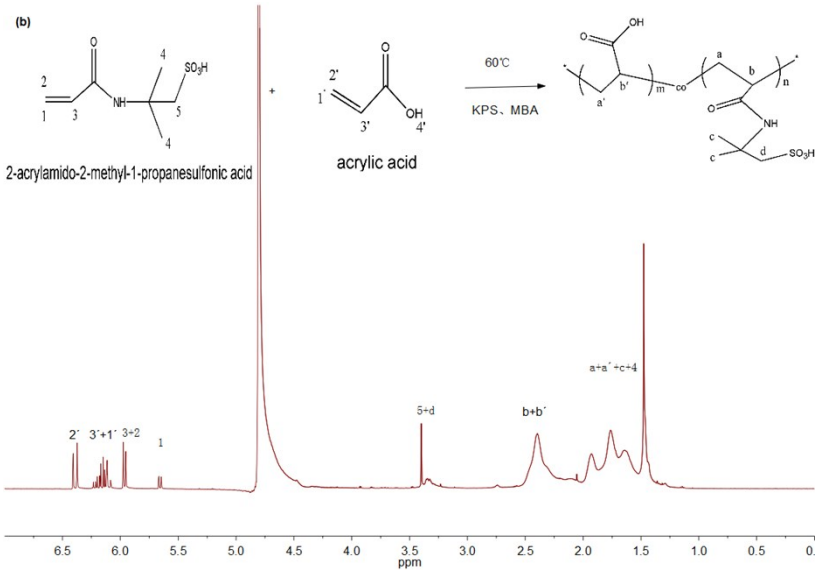
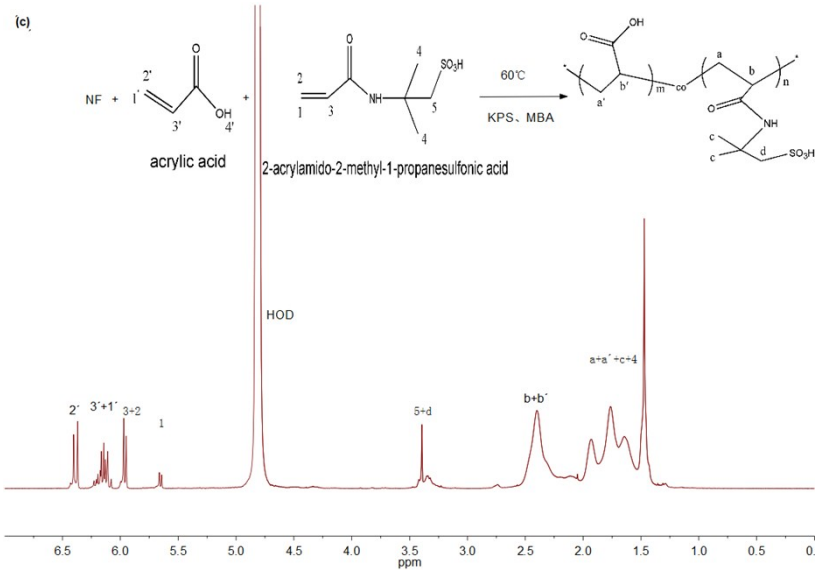



Figure S1 FTIR spectrums of FC5-AB1 and PC5-A hydrogels.


(a)
acrylic acid
2-acrylamido-2-methyl-1-propanesulfonic acid
2´
3+2
3´+1´
1
5
4
6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.
ppm


(b)
2-acrylamido-2-methyl-1-propanesulfonic acid
acrylic acid
60℃
KPS、MBA
2´
3´+1´
3+2
1
5+d
b+b´
a+a´+c+4
6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.
ppm


(c)
acrylic acid
2-acrylamido-2-methyl-1-propanesulfonic acid
60℃
KPS、MBA
HOD
2´
3´+1´
3+2
1
5+d
b+b´
a+a´+c+4
6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.
ppm

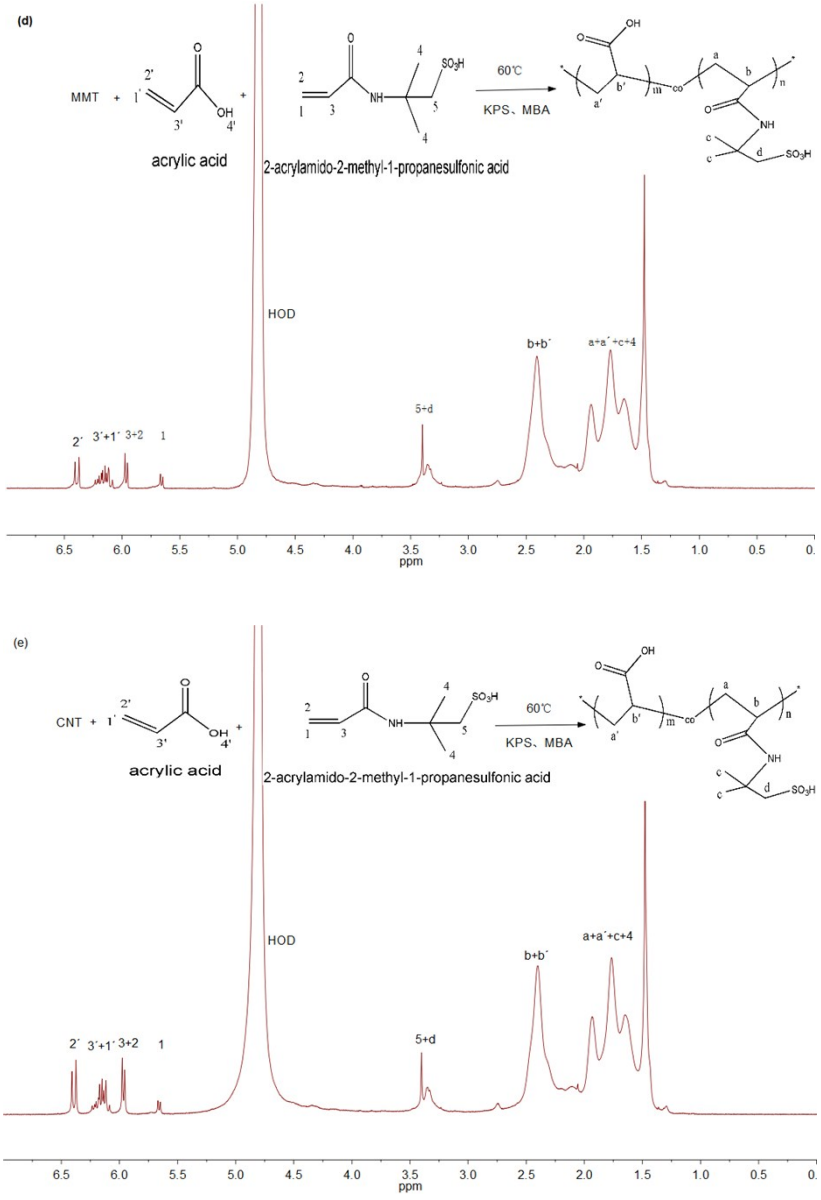



Figure S2 $^{1}$H NMR spectra of monomer solution sample (a) and four as-polymerized samples (b-e).

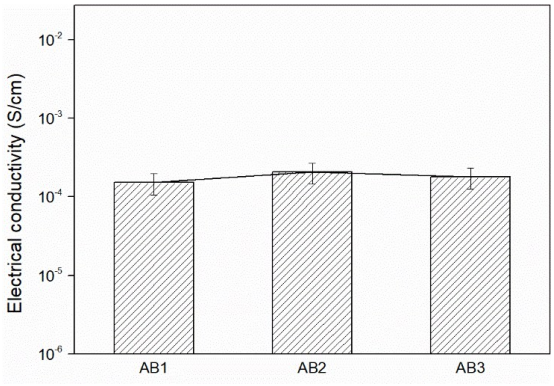



Figure S3 Electrical conductivity of three comparative hydrogels.

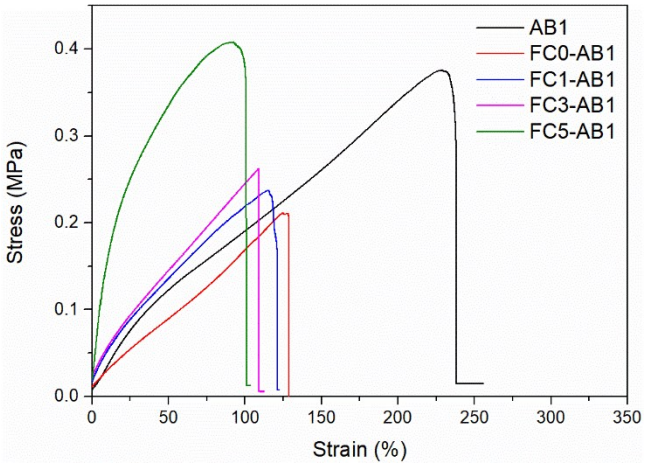



Figure S4 Tensile stress-strain curves of the comparative and targeted hydrogels.

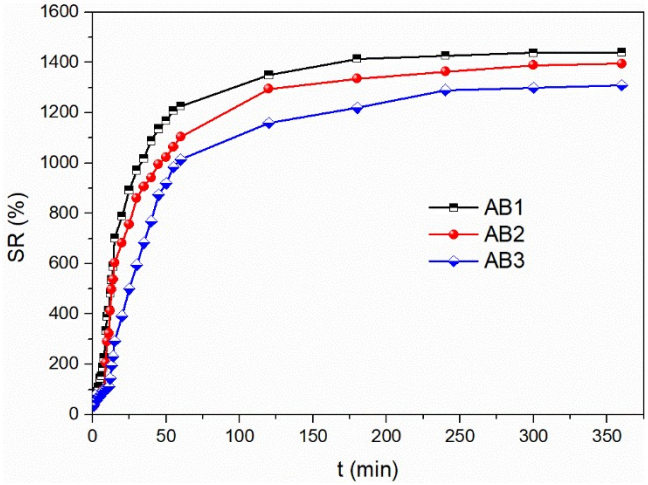



Figure S5 Equilibrium swelling process of comparison hydrogels in deionized water.

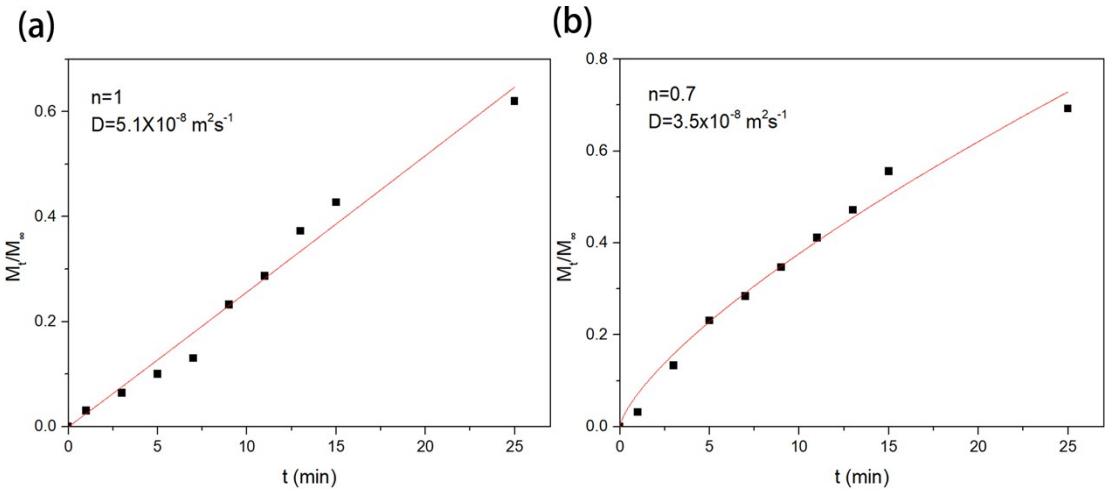



Figure S6 Dependence of the water fractional content ($Mt/M_{\infty}$) on the time for AB1 (a) and FC5-AB1 (b) hydrogels.

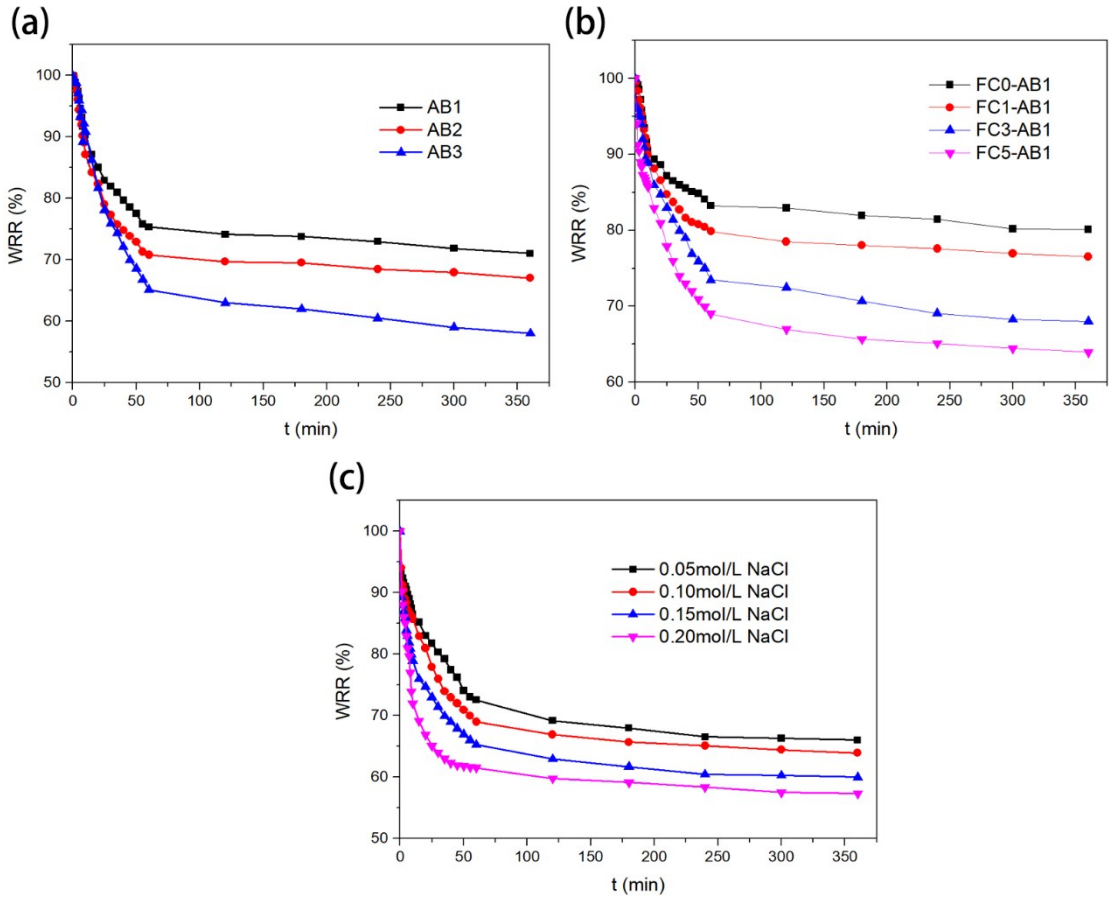



Figure S7 Water retention performance of hydrogels in NaCl solution. (a, b) in 0.10 mol•$L^{-1}$ NaCl solution, (c) FC5-AB1.

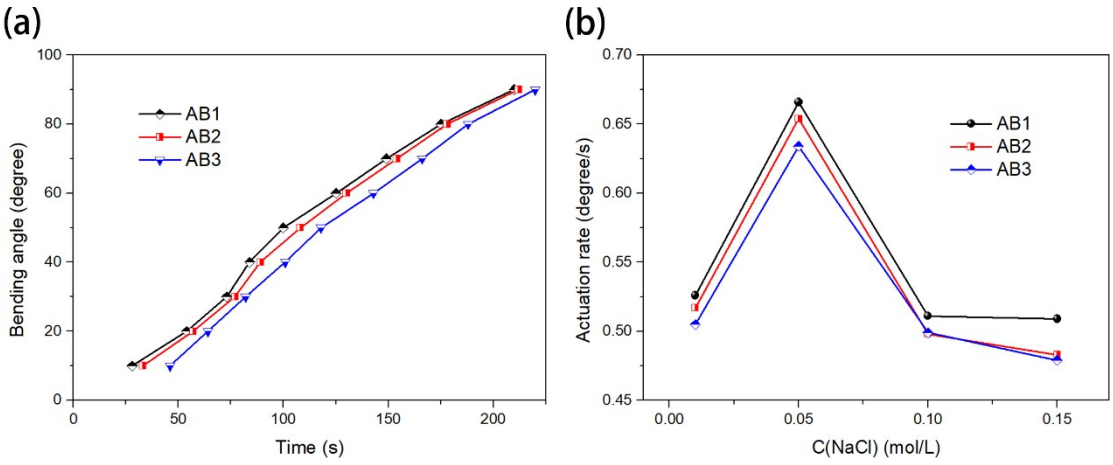



Figure S8 (a) Bending behavior of comparison samples AB1, AB2 and AB3 hydrogels in 0.05 mol·$L^{-1}$ NaCl solution under an applied electric field of 375 V•$m^{-1}$, (b) Effect of the ionic strength on the actuation rate for comparison samples AB1, AB2 and AB3 hydrogels.