Electronic Supplementary Information

Self-healable polyvinyl alcohol-based hydrogel electrolyte for smart electrochemical capacitors

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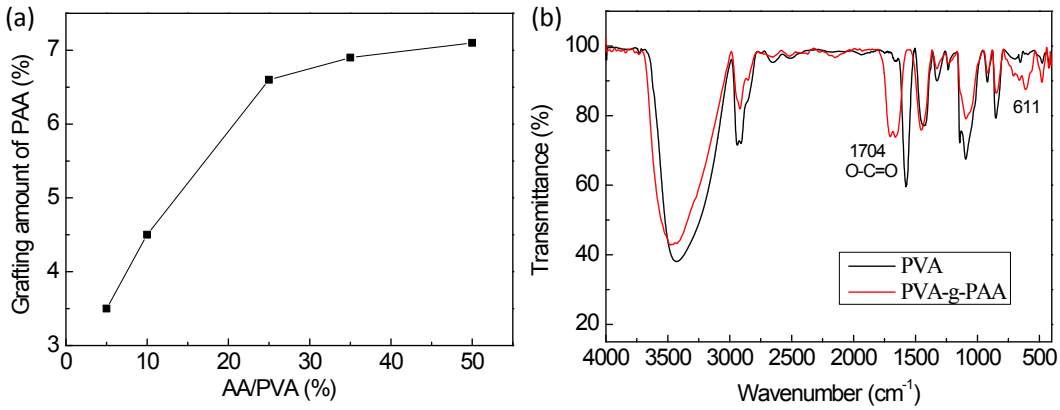

Fig. S1. (a) Dependence of grafting amount of PAA on the molar ratio of acrylic acid to PVA. (b) FT-IR spectra of the PVA and PVA-*g*-PAA.

Fig. S1b is the FT-IR spectra of PVA and PVA-*g*-PAA. Compared with that of PVA, a peak near 1704 cm^{-1} is observed for PVA-*g*-PAA, which can be ascribed to C=O stretching vibration of PAA. In addition, the peak at 611 cm^{-1} is strengthened after the grafting reaction, indicating the presence of O−H out-plane vibration of the carboxylic group.[1,2] The results suggest that polyacrylic acid is grafted to PVA.

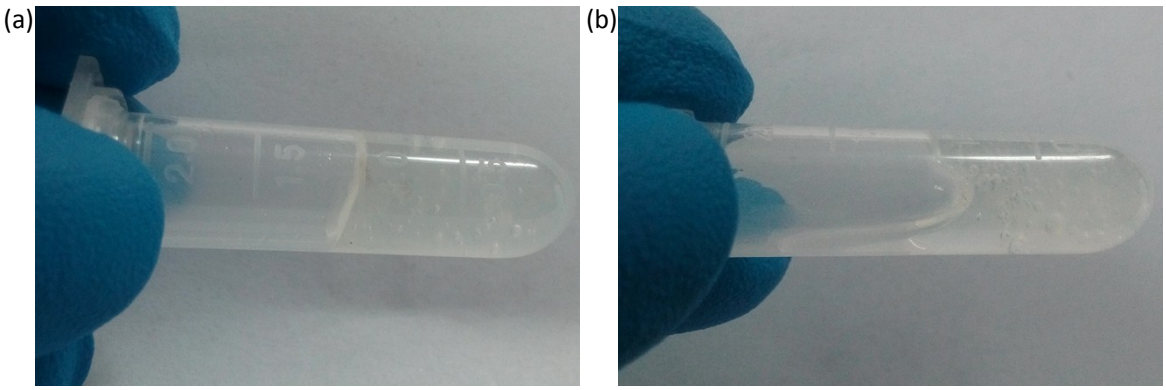

Fig. S2. Photos of the PVA-*g*-PAA/KCl hydrogel electrolyte prepared from 5.0 mM borax, (a) fresh electrolyte, (b) after storage for 5 h.

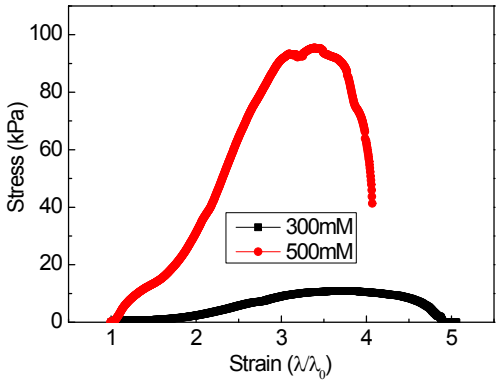

Fig. S3. Stress-strain curves of the PVA-*g*-PAA hydrogel electrolytes with 300 mM and 500 mM KCl.

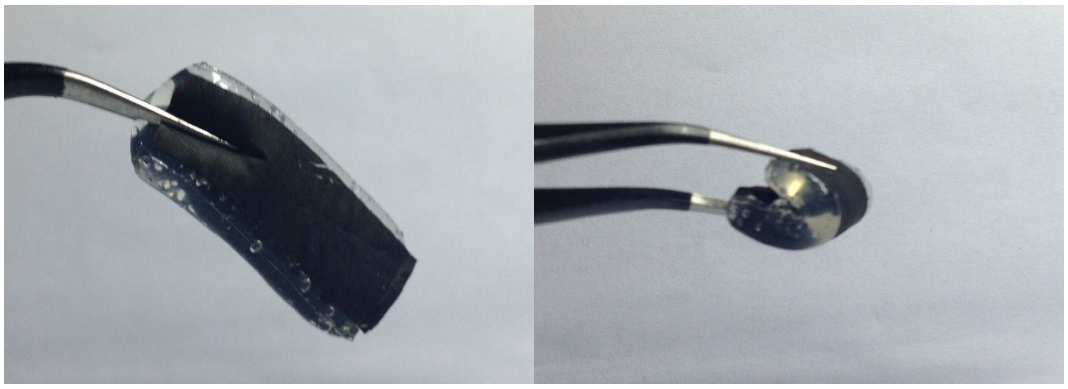

Fig. S4. The capacitor could be easily bended by tweezers.

Table S1. Ionic conductivity of the reported PVA-based electrolytes for electrochemical capacitors

PVA-based electrolytes	Ionic conductivity / mS cm^{-1}	References
PVA/potassium borate/KCl	1.02	3
PVA/1-butyl-3-methylimidazolium chloride/Li_2SO_4	37	4
PVA/H_2SO_4	82	5
PVA/KOH	~10	6
PVA/KOH/$K_3[Fe(CN)_6]$	45.6	7
PVA/poly(epichlorohydrin)/KOH	1-10	8
Cross-linked PVA/H_2SO_4	24.9	9
PVA/H_3PO_4	3.4	10
GO/Boron/PVA/KOH	195	11
PVA/H_2SO_4/*p*–benzenediol	34.8	12
PVA/KOH/KI	12.73	13
PVA/PVP/KOH	530	14
PEO/PVA/KOH	10	15

Table S2. Change of R_s and R_{ct} of the capacitor before and after self-healing.

	R_s / Ω	R_{ct} / Ω
Before cut	1.85	13.55
After the 1st healing	1.95	13.76
After the 5th healing	1.95	13.95
After the 10th healing	1.94	14.27

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