Supporting Information

Zwitterionic hydrogel with a surprised function of increasing the ionic conductivity of alkali metal chloride or sulfuric acid water-soluble electrolyte

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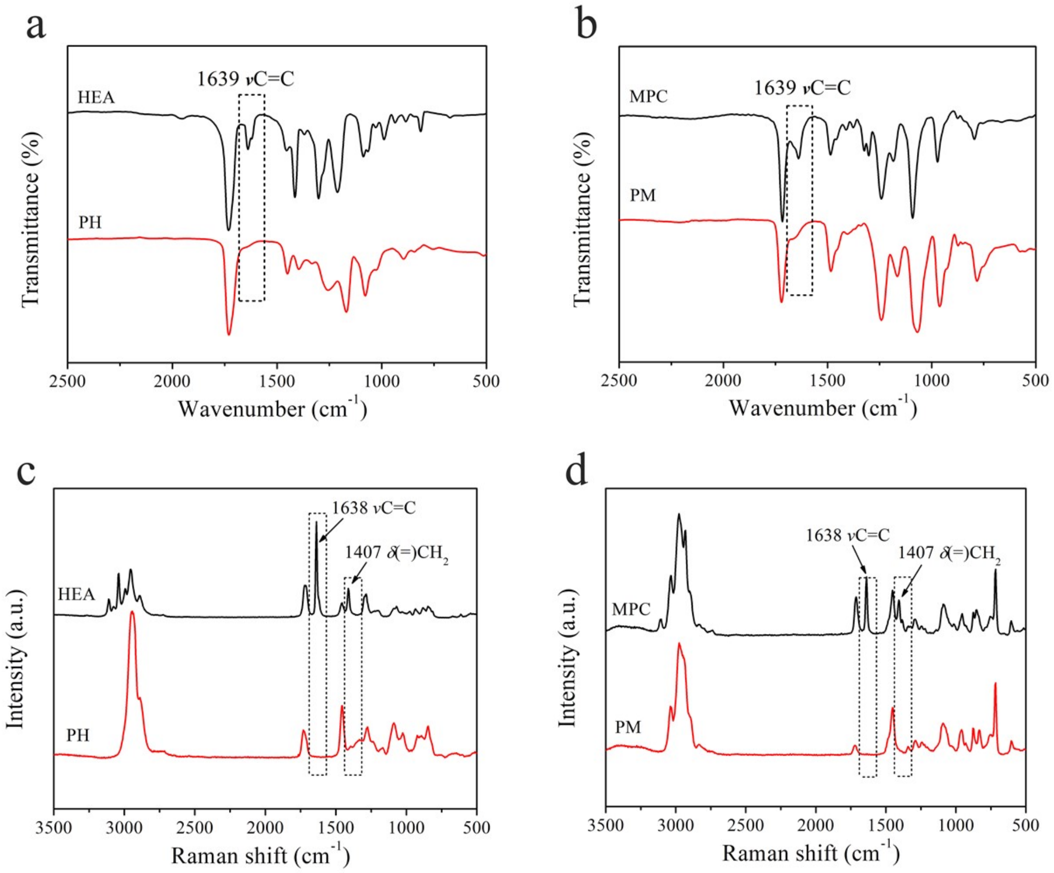

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ig S1. FTIR spectra of (a) HEA monomer and PH, (b) MPC monomer and PM. Raman spectra of (c) HEA monomer and PH, (d) MPC monomer and PM.

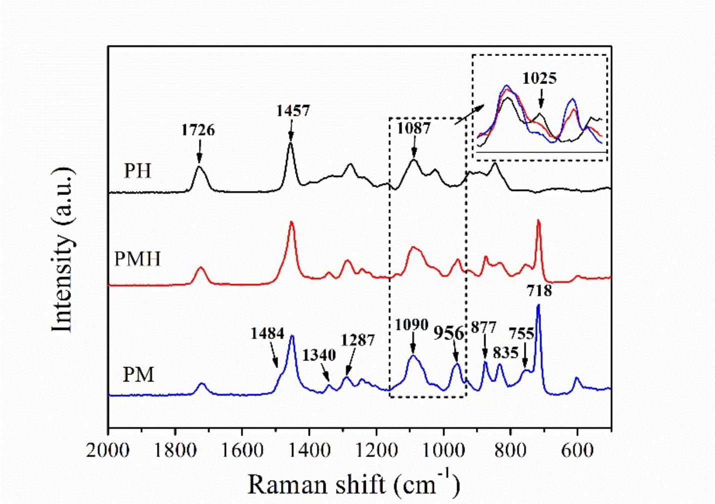

Fig S2. Raman spectra of PH, PMH and PM.

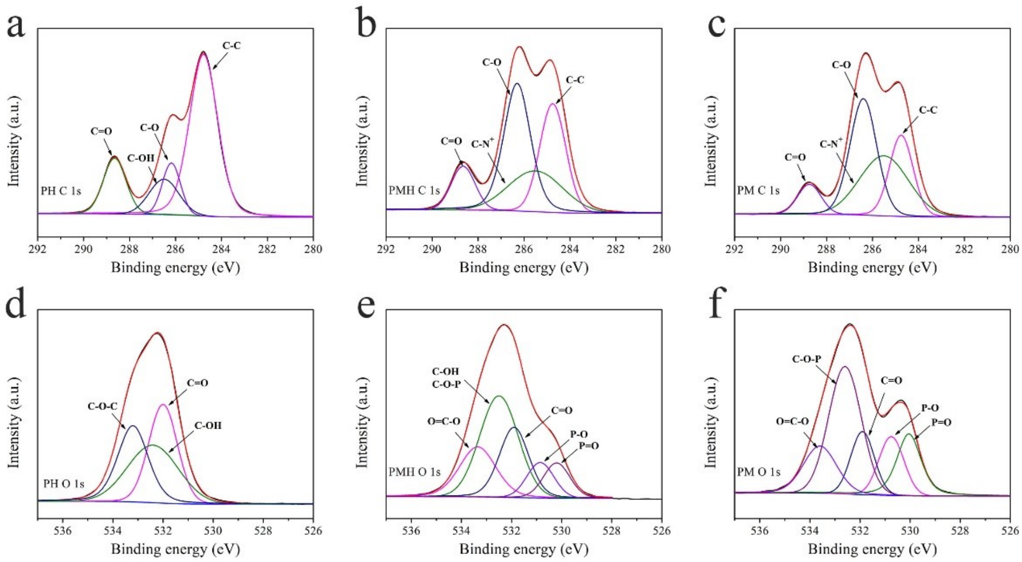

Fig S3. The C 1s spectra of (a) PH, (b) PMH and (c) PM. The O 1s spectra of (d) PH, (e) PMH and (f) PM.

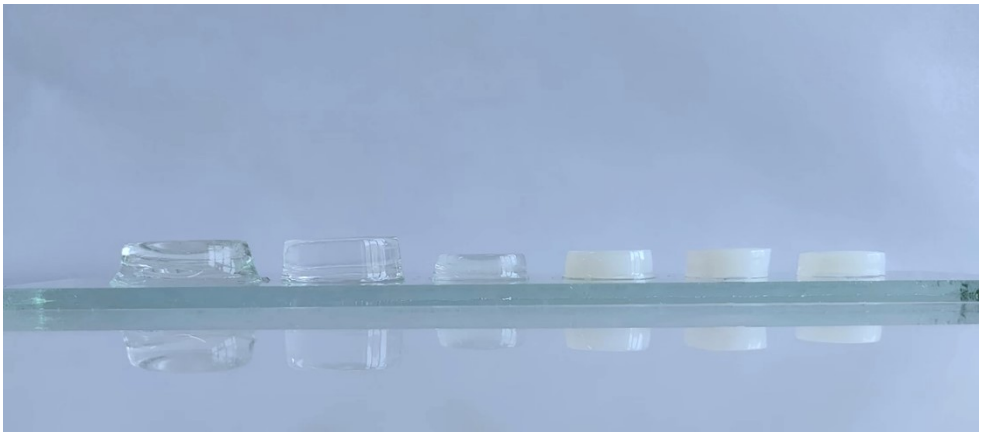

Fig S4. The optical photograph of PH electrolyte at different concentration of H_2SO_4 (From left to right: 0.5, 1, 1.5, 2, 2.5, 3 M).

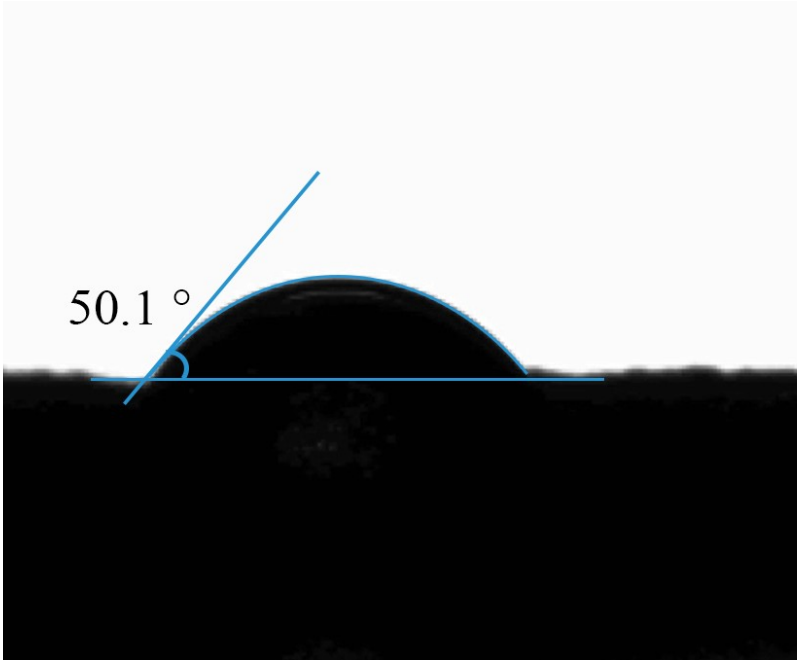

Fig S5. Static water contact angles of PH aerogel.

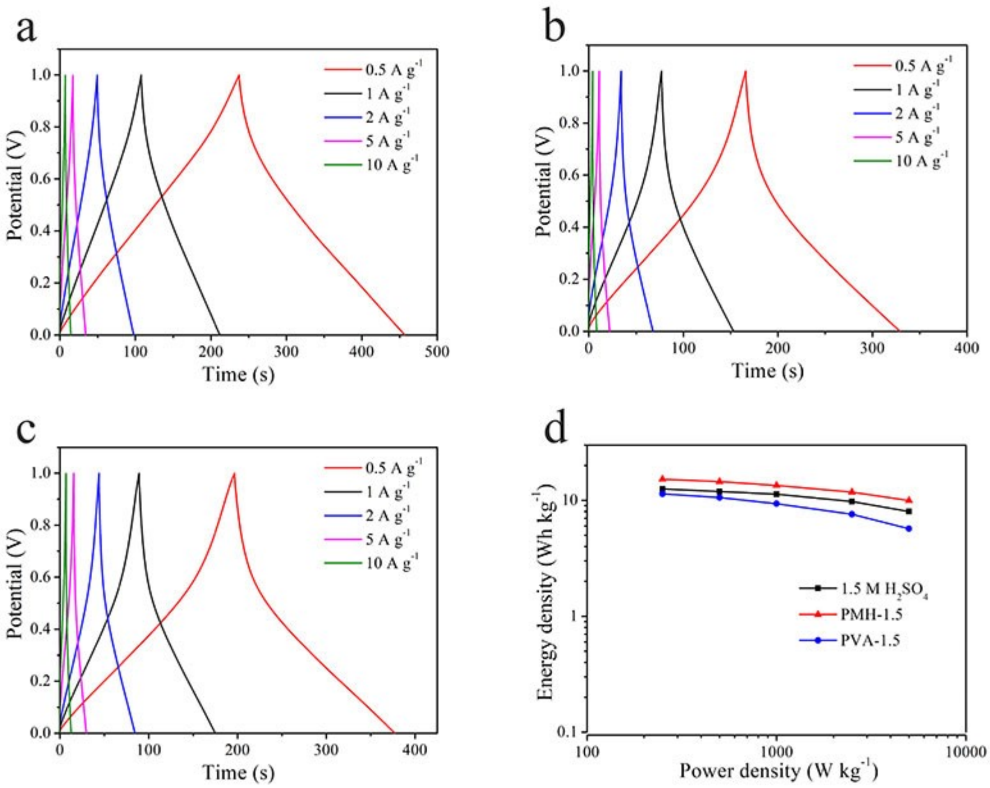

Fig S6. Charge/discharge curves of (a) PMH-1.5 SC, (b) PVA-1.5 SC and (c) 1.5 M H_2SO_4 SC at different current density.

Table S1. Overview of the Raman and FTIR band assignments.[1-8]

Raman shift (cm^{-1})	Assignments	FTIR wavenumbers (cm^{-1})	Assignments
3411	νO−H	3370	νO−H
2954	$\nu_{as}CH_2$	2950	νCH, νCH_2, νCH_3, $\nu_{as}CH_2$
1726	C=O	1730	C=O
1457	δCH_2, δCH_3	1453	δCH_2, δCH_3
1341	δCH_3, τCH_2, ωCH_2	1396	δCH_3, τCH_2, ωCH_2
1287	τCH_2, ωCH_2	1260	τCH_2, ωCH_2
1243	ν_{as}CC(=O)O	1223	ν_{as}CC(=O)O
1087	$\nu_s PO_2$, $\nu_{as}OCH_2C$, ρCH_2, ρCH_3	1168	ν_{as}COC
1025	νCC, νCO(H)	1080	$\nu_{as}OCH_2C$, ρCH_2, ρCH_3
957	ρCH_3	966	ρCH_3
895	ν_sCCO(H)	897	νCO(H)
877	ρCH_2, $\nu_s CN^+$	790	ν_sOPO
850	ρCH_2	602	νCCO
835	ν_sCOC, ν_{as}POC		
718	$\nu_s CN^+$		
603	ν_sCCO		

Table S2. The relative elemental contents (at.%) of PH, PMH and PM.

Samples	C (at.%)	O (at.%)	N (at.%)	P (at.%)
PH	67.40	32.60		
PMH	61.58	31.42	3.18	3.82
PM	61.64	28.89	4.32	5.15

Table S3. Relative ratio (at.%) of different carbon components in PH, PMH and PM. From C 1s XPS spectra which were calculated based on the areas of the XPS peaks.

Samples	~284.8 eV (C−C)	~285.5 eV (C−N)	~286.2 eV (C−OH)	~286.5 eV (C−O)	~288.7 eV (C=O)
PH	60.09		11.44	12.7	15.77
PMH	29.20	21.65		38.69	10.46
PM	22.54	33.00		36.67	7.79

Table S4. Relative ratio (at.%) of different oxygen components in PH.

Samples	~532.0 eV (C=O)	~532.4 eV (C−OH)	~533.2 eV (C−O)
PH	34.38	34.58	31.04

Table S5. Relative ratio (%) of different oxygen components in PMH and PM.

Samples	~530.1 eV (P=O)	~530.8 eV (P−O^-)	~531.9 eV (C=O)	~532.6 eV (C−O−P(H))	~533.6 eV (C−O)
PMH	9.83	9.43	25.19	41.61	13.94
PM	16.96	13.88	14.04	39.35	15.77

Table S6. Summary of ionic conductivity of different hydrogel electrolyte.

hydrogel electrolyte	ionic conductivity ($S\ m^{-1}$)	Refs.
SBMA/HEA/LiCl	14.6	9
polypyrrole imbibed poly(HEA)/poly(ethylene glycol)	2.1	2
Zw-PSBMA-EG/$MgCl_2$	13.7	10
PVA-g-PAA/KCl	4.1	11
PDMP-Li GPE	8.9×10^{-1}	12
PAAm/LiCl	8.1	13
PAM/PBA-IL/CNF	0.7	14
50:50 P(AMPSLi-c-DMAA)	5.7×10^{-2}	15
PAAm/gelatin/LiCl	8.3	16
P(VI-co-HPA)/$NaNO_3$	6.0	17
PAO/PEI/LiCl	19.1	18
PAMPS/PAAm/LiCl/ethylene glycol	2.3	19
PVA/PAM-ILs	0.7	20
PVA-GB	7.0	21
PVA-H_2SO_4	8.2	22
Alg/PVA/$ZnSO_4$	1.5	23
PMH-LiCl	32.0	This work
PMH-NaCl	35.5	This work
PMH-KCl	38.9	This work
PMH-1.5 H_2SO_4	64.8	This work

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