Electronic Supplementary Material (ESI) for Dalton Transactions.

MOF Supported Crystalline Ionic Liquid: New Type of Solid Electrolyte for Enhanced and High Ionic Conductivity

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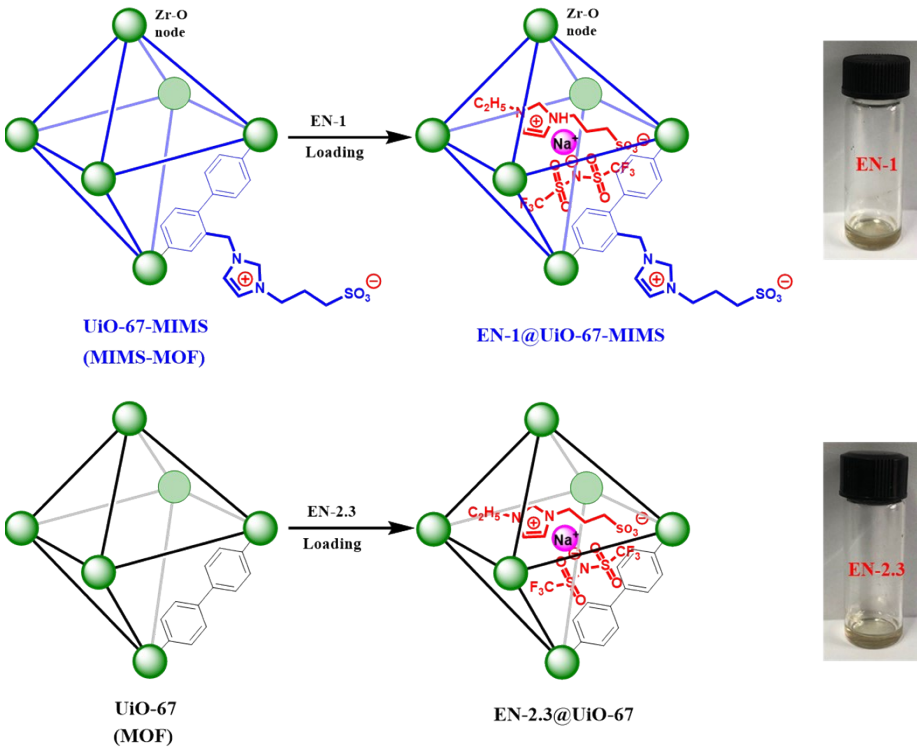

Figure S1. Illustration of preparation of EN-1@UiO-67-MIMS and EN-2.3@UiO-67. Photographs of right are as-made ionic liquids EN-1 and EN-2.3. Components of which are shown in Table 1.

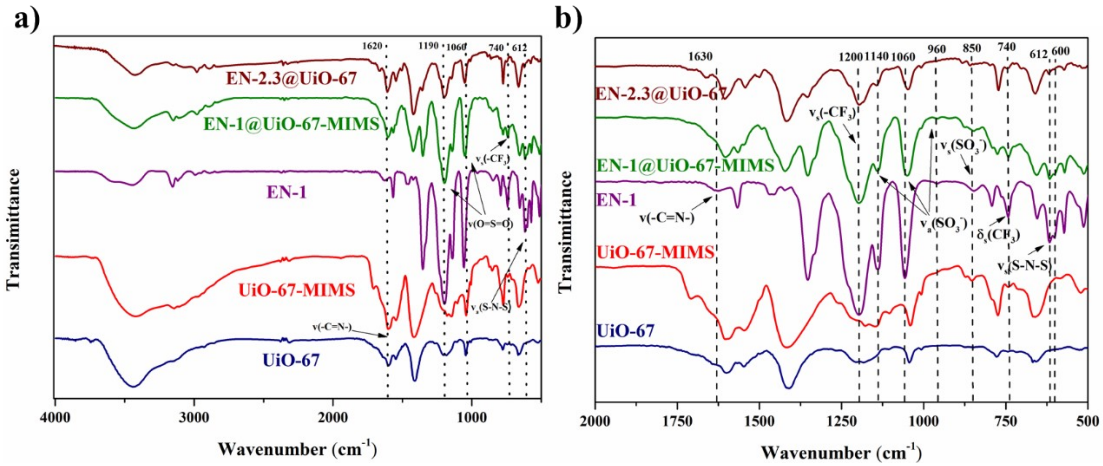

Figure S2. FT-IR curves of UiO-67, UiO-67-MIMS, EN-1 and EN-1@UiO-67-MIMS (a) and its magnify show within 500 cm^{-1} ~ 2000 cm^{-1} range (b).

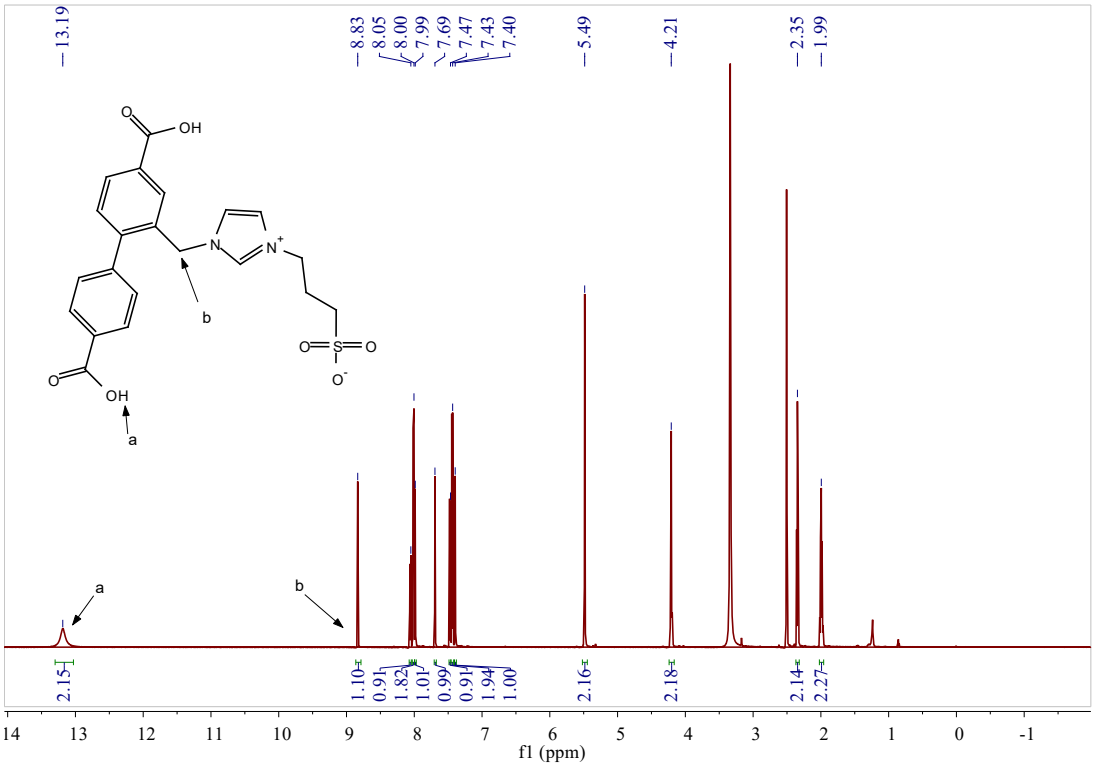

Figure S3. [1]H-NMR spectrum of BPDC-MIMS.

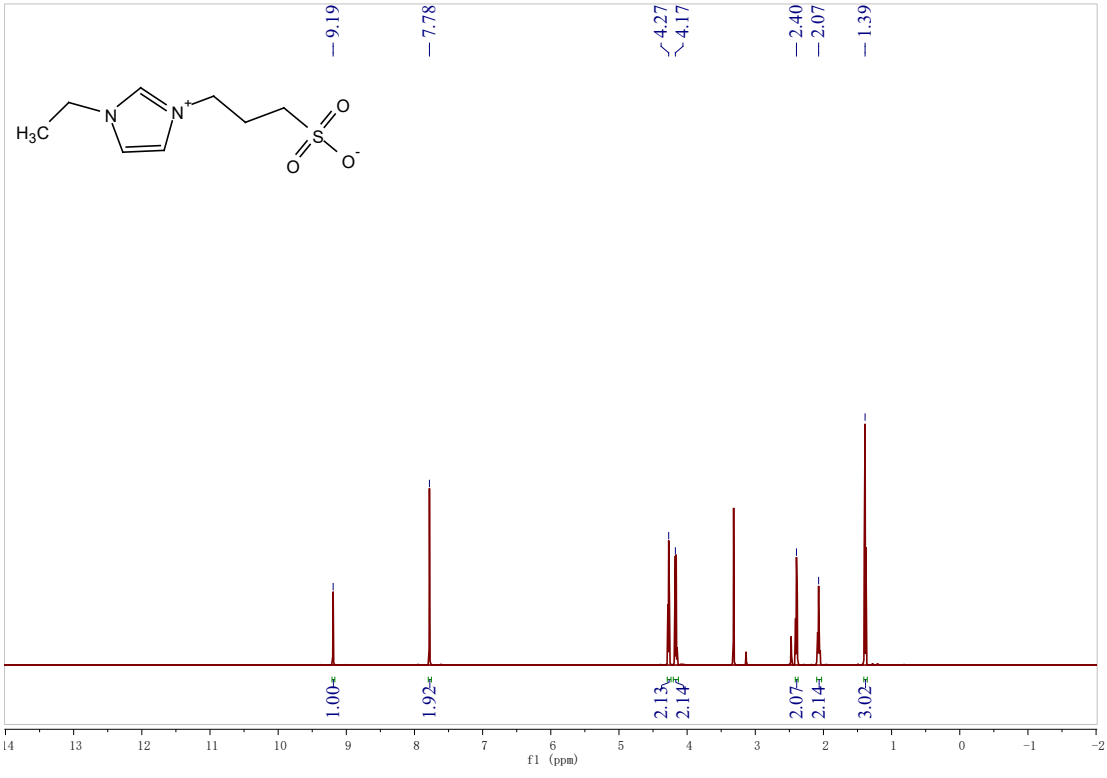

Figure S4. [1]H-NMR spectrum of EIMS.

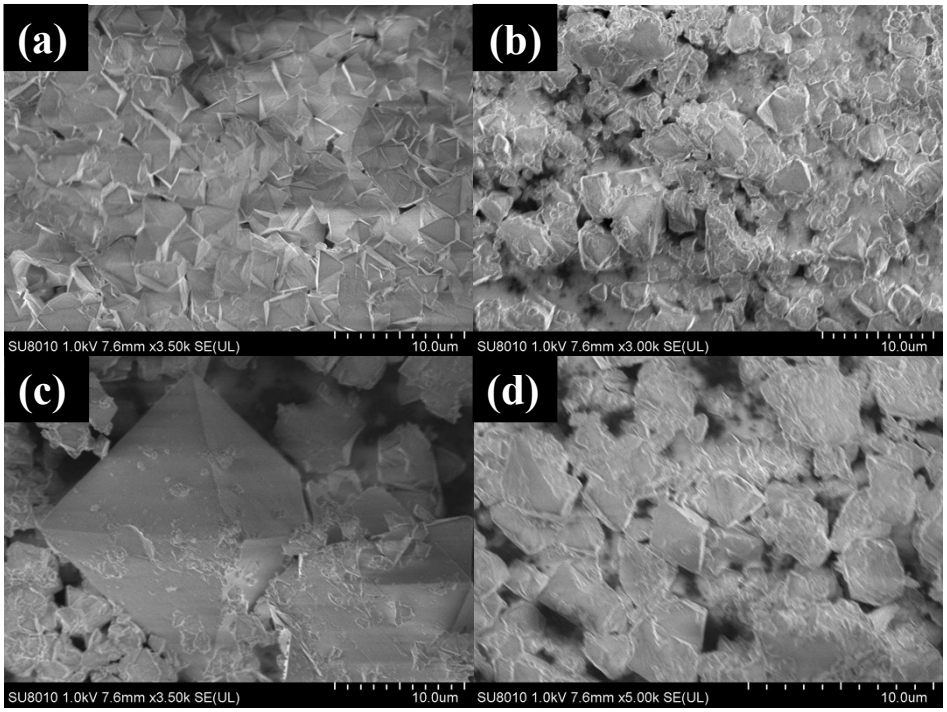

Figure S5. SEM images of (a) UiO-67-MIMS, (b) EN-1@UiO-67-MIMS, (c) UiO-67 and (d) EN-2.3@UiO-67.

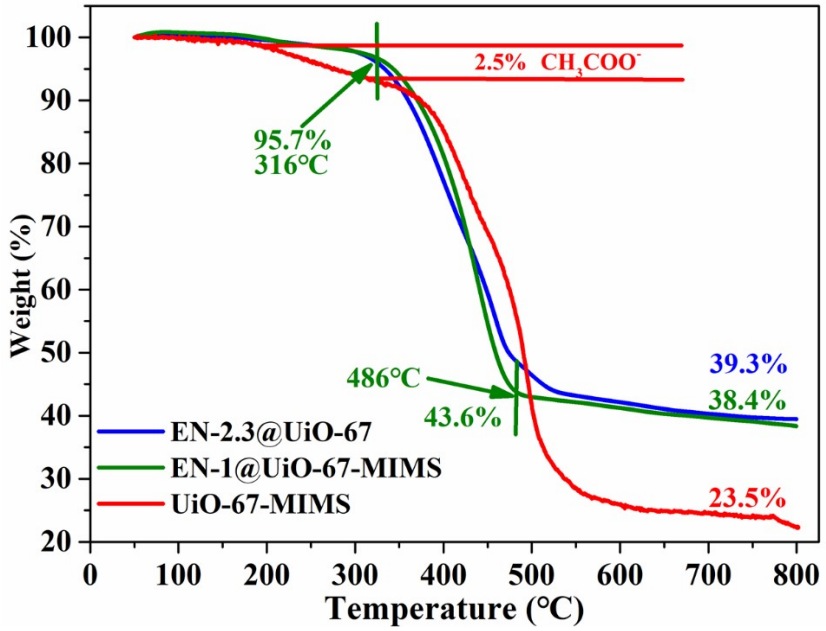

Figure S6. TG curves of UiO-67-MIMS, EN-1@UiO-67-MIMS and EN-2.3@UiO-67.

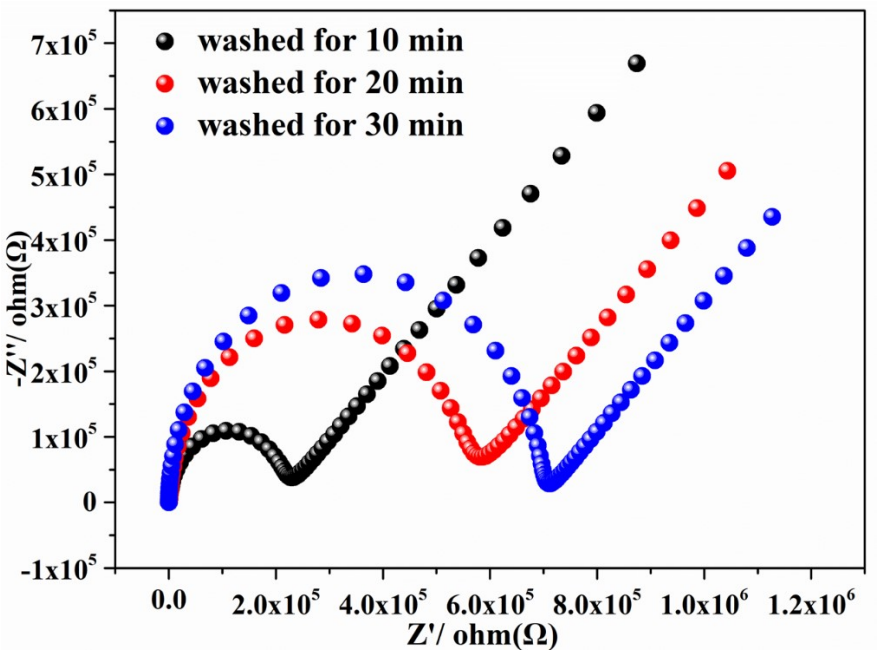

Figure S7. Nyquist plots of EN-1@UiO-67-MIMS after soaked in water.

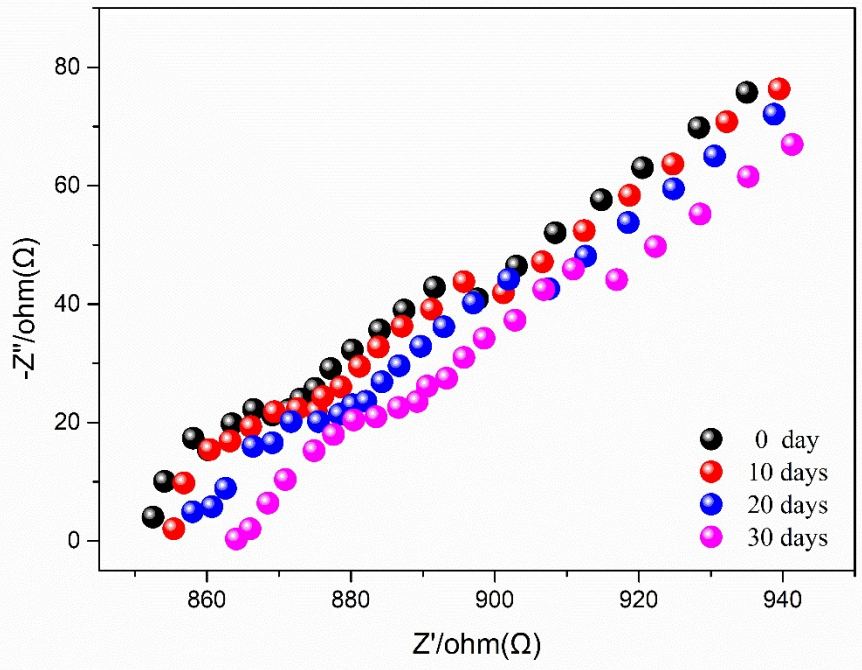

Figure S8. Nyquist plots of EN-1@UiO-67-MIMS under 150 °C for several days.

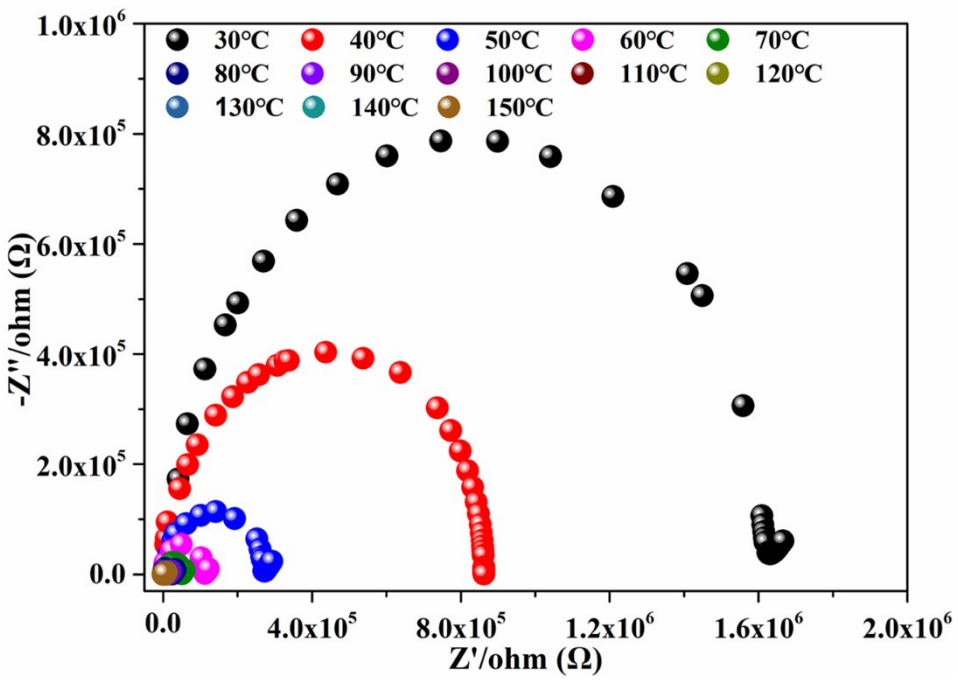

Figure S9. Nyquist plots of EN-1 under different temperatures.

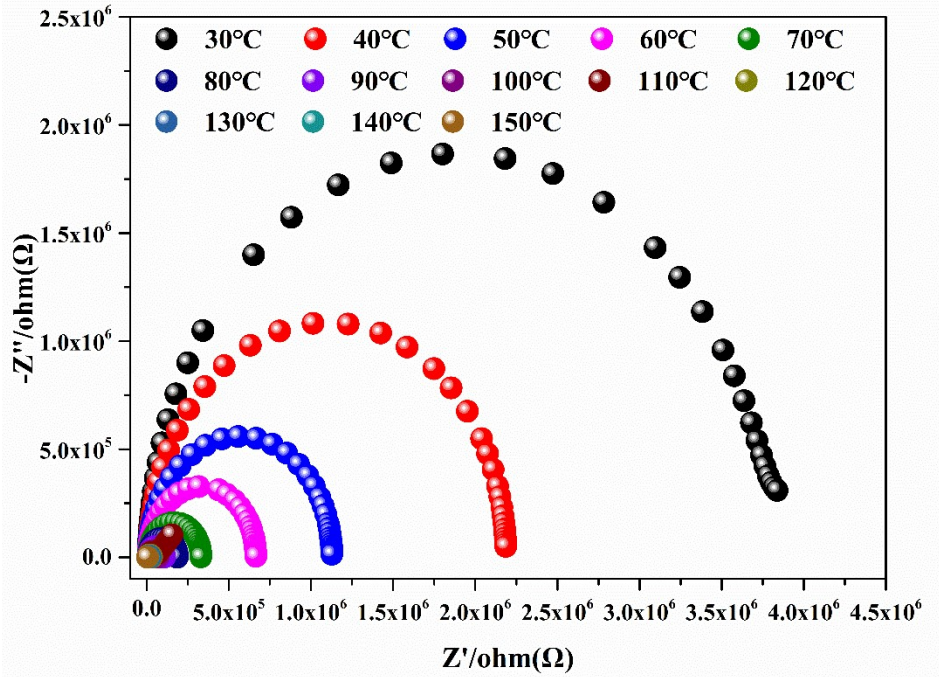

Figure S10. Nyquist plots of EN-2.3 under different temperatures.

Table S1. Comparison of ionic conductivities of EN-2.3@UiO-67 and EN-1@UiO-67-MIMS with representative conductors based on MOF matrix blended with IL or slat of Na^+.

	Composites (IL/Salt@MOF)	T/°C	σ / S cm^{-1}	Ref.
IL	$[Na_{0.06}Emim_{0.94}][BF_4]$@MIL-101-$SO_3Na$	150	1.32×10^{-2}	1
	$[Na_{0.03}Emim_{0.97}][NTf_2]$@MIL-101-$SO_3Na$	150	8.66×10^{-3}	1
	$[Na_{0.04}Bmim_{0.96}][NTf_2]$@MIL-101-$SO_3Na$	150	1.75×10^{-3}	1
	$[Na_{0.07}C_4Py_{0.93}][BF_4]$@MIL-101-$SO_3Na$	150	1.31×10^{-3}	1
	$[Na_{0.05}Bmim_{0.95}][PF_6]$@MIL-101-$SO_3Na$	150	1.10×10^{-4}	1
	$[Li_{0.2}Emim_{0.8}][NTf_2]$ @ZIF-8	22	4.40×10^{-6}	2
	$[Li_{0.2}Emim_{0.8}][NTf_2]$ @MOF-525(Cu)	30	3.00×10^{-6}	3
		100	4.90×10^{-3}	3
	$[Li_{0.17}Emim_{0.83}][NTf_2]$ @UiO-67(Cr)	25	1.00×10^{-4}	4
Salt	0.35LiOiPr·0.25LiBF4·EC·DEC@MgMOF-74	27	3.10×10^{-4}	5
	LiOtBu@UiO-66	35	1.80×10^{-5}	6
	(Na0.1EMIM0.9)TFSI@ZIF-8	25	2×10^{-4}	7
	PLM@LE	20	6.6×10^{-4}	8
	MIL-121/Na+SE	30	1.2×10^{-4}	9
IL	EN-2.3@UiO-67	150	2.95×10^{-4}	This work
	EN-1@UiO-67-MIMS	150	1.02×10^{-2}	This work

Table S2. BET, pore volume, pore size of UiO-67, UiO-67-MIMS, EN-1@UiO-67-MIMS and EN-2.3@ UiO-67.

Sample	BET (m^2/g)	Pore volume cm^3/g	Pore size (Å)
UiO-67	2214.28	0.92	~12
UiO-67-MIMS	300.33	0.43	~6/~12
EN-1@UiO-67-MIMS	1.64	0.01	ignorable
EN-2.3@UiO-67	19.66	0.03	ignorable

Table S3 Conductivities of **EN-1@UiO-67-MIMS**, **EN-2.3@UiO-67**, **EN-1**and **EN-2.3** at 150° and room temperature.

	EN-1(S cm^{-1})	EN-2.3(S cm^{-1})	EN-1@UiO-MIMS(S cm^{-1})	EN-2.3@UiO-67(S cm^{-1})
30°C	2.09×10^{-6}	2.38×10^{-6}	1.24×10^{-4}	2.78×10^{-7}
150 °C	5.07×10^{-3}	1.92×10^{-3}	1.02×10^{-2}	2.95×10^{-4}

Table S4. Ionic conductivities of EN-1@UiO-67-MIMS and at 150°C for different days, and the retention test of EN-1@UiO-67-MIMS and EN-2.3@UiO-67 soaked in water.

Materials	Ionic conductivity (σ / S cm^{-1})
EN-1@UiO-67-MIMS heated for 0days	1.02×10^{-2}
EN-1@UiO-67-MIMS heated for 10days	1.01×10^{-2}
EN-1@UiO-67-MIMS heated for 20days	1.00×10^{-2}
EN-1@UiO-67-MIMS heated for 30days	0.98×10^{-2}
UiO-67	5.91×10^{-8}
UiO-67-MIMS	4.80×10^{-8}
EN-1@UiO-67-MIMS soaked in water for 30 min	2.30×10^{-5}
EN-2.3@UiO-67 soaked in water for 30 min	6.90×10^{-8}

Reference

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