

# Supporting information

## Proton-conducting layered structures based on transition metal oxo-clusters supported by Sb(III)tartrate scaffolds

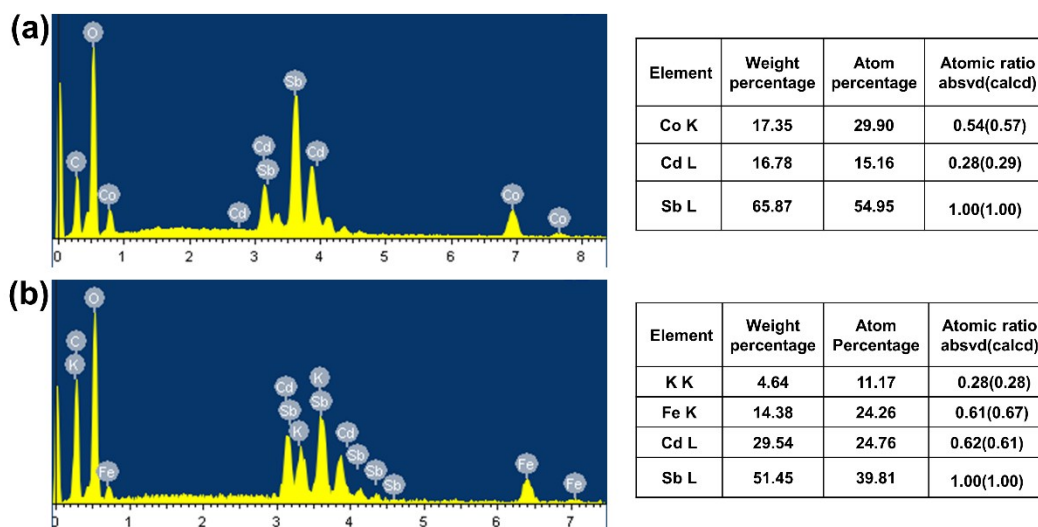
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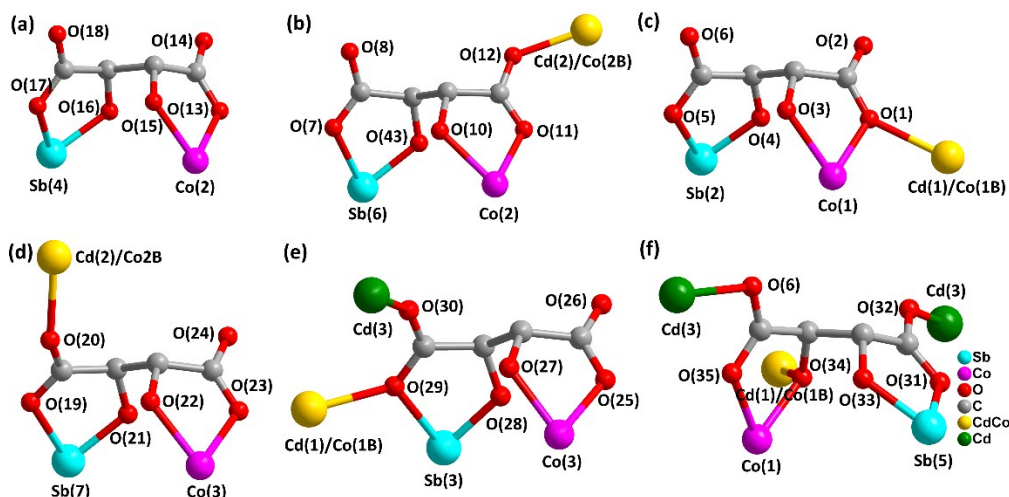
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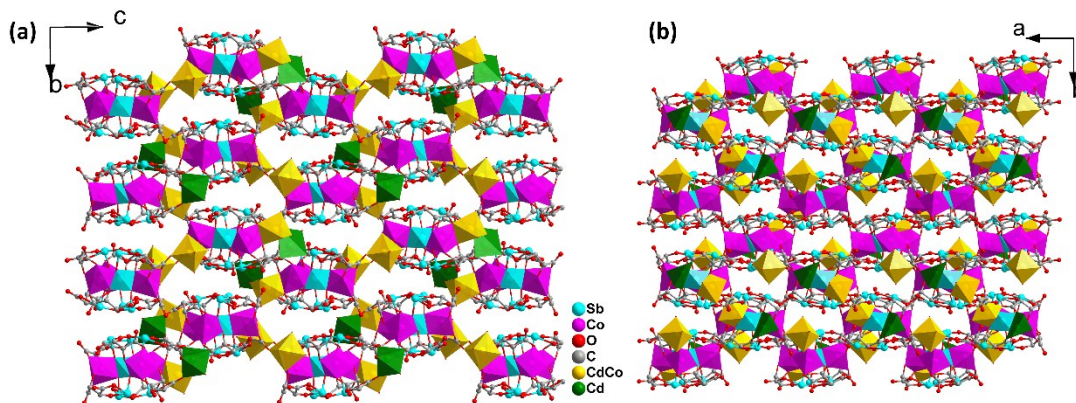
**Fig. S1** Energy dispersive spectroscopy (EDS) results of compounds **1** (a) and **2** (b).

**Table S1.** Inductively Coupled Plasma (ICP)-atomic emission spectrometry (AES) data (%) of compounds **1** and **2**.

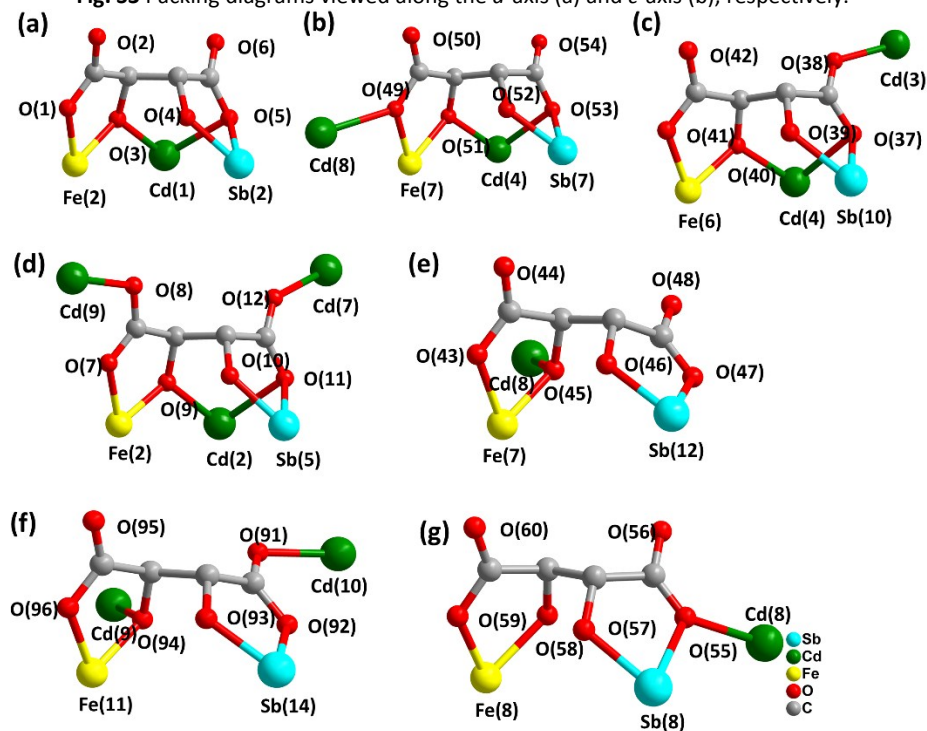
Compound <b>1</b>	ICP(%)	Sb	Cd	Co	
	Weight percentage(calcd.)	32.65	8.61	9.03	
	Weight percentage	31.92	6.99	9.14	
Compound <b>2</b>	ICP(%)	Sb	Cd	Fe	K
	Weight percentage(calcd.)	27.17	15.33	8.31	2.42
	Weight percentage	25.20	14.85	8.57	2.22



**Fig. S2** Schematic views of the coordination modes of the tartrate ligands in **1**. (a) mode A, (b) mode B, (c) mode C, (d) mode D, (e) mode E and (f) mode F.



**Fig. S3** Packing diagrams viewed along the *a*-axis (a) and *c*-axis (b), respectively.



**Fig. S4** Schematic views of the coordination modes of the tartrate ligands in **2**. (a) mode A, (b) mode B, (c) mode C, (d) mode D, (e) mode E, (f) mode F and (g) mode G.

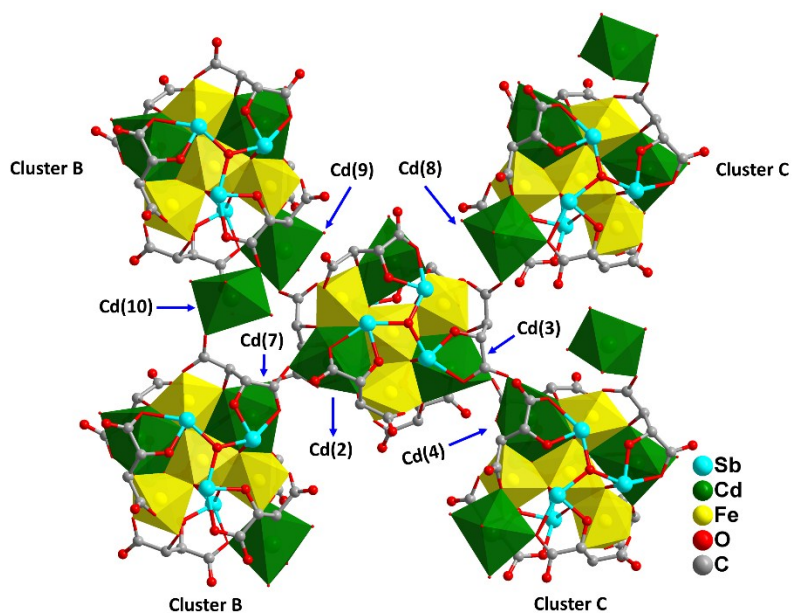


Fig. S5 The connectivity of cluster A in 2.

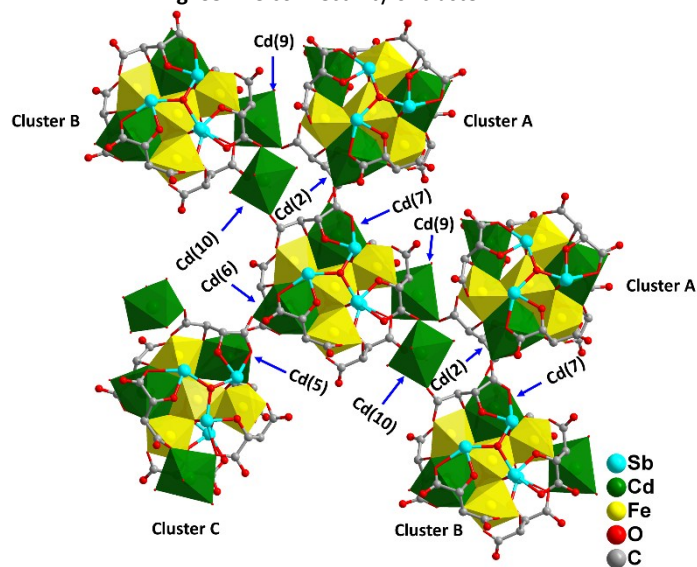


Fig. S6 The connectivity of cluster B in 2.

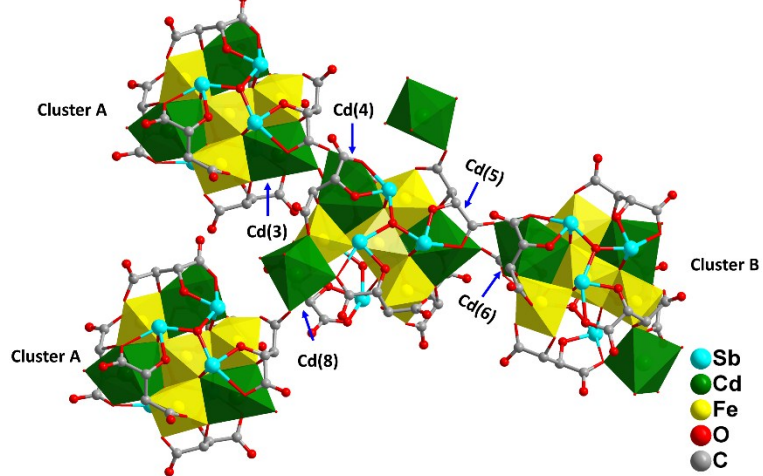


Fig. S7 The connectivity of cluster C in 2.

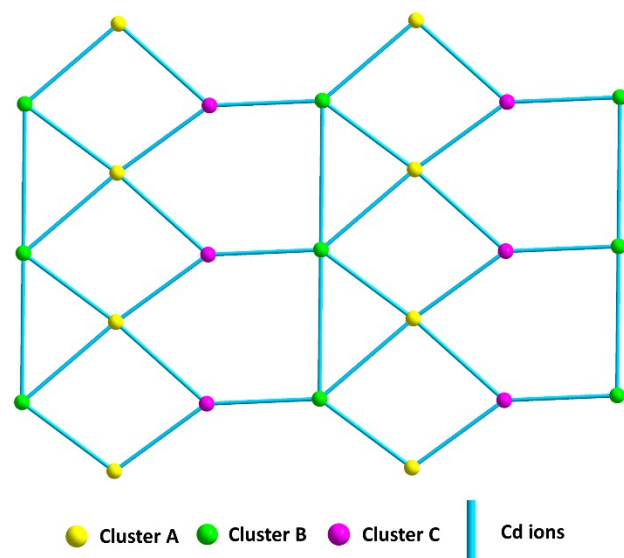


Fig. S8 Topological view of one 2D layer in **2**.

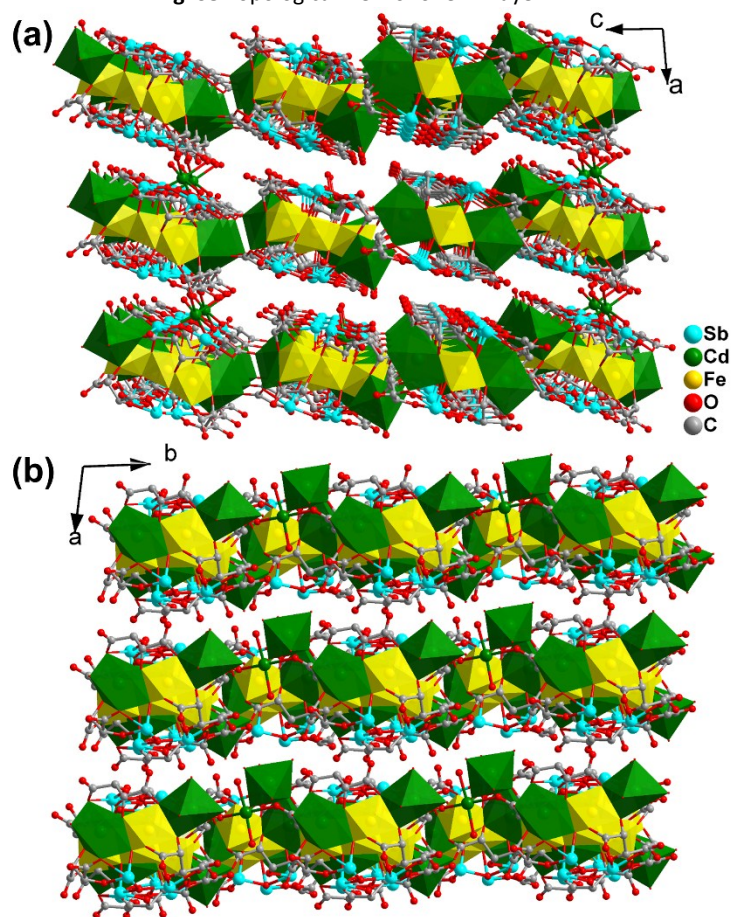


Fig. S9 Packing diagram of **2** viewed along the *b*- and *c*-axis, respectively. The disordered Cd(1B) and Cd(1C) are omitted for clarity.

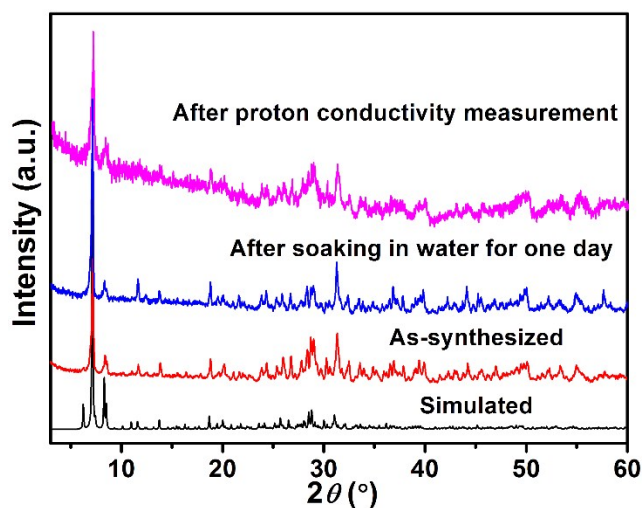


Fig. S10 Simulated and observed powder X-ray diffraction (PXRD) patterns of 1.

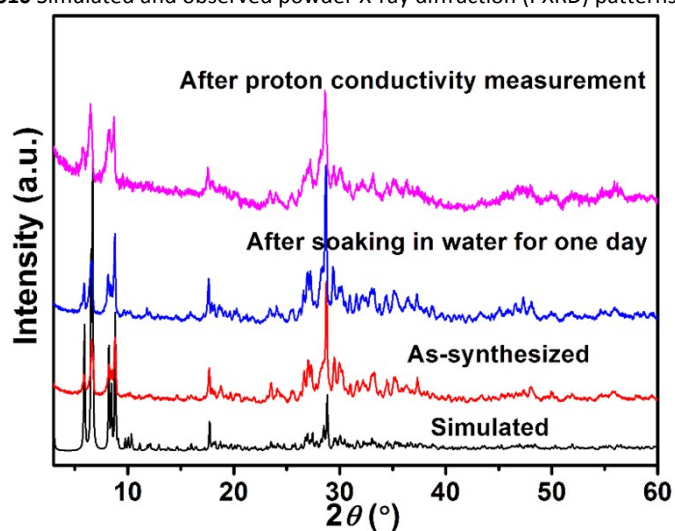


Fig. S11 Simulated and observed PXRD patterns of 2.

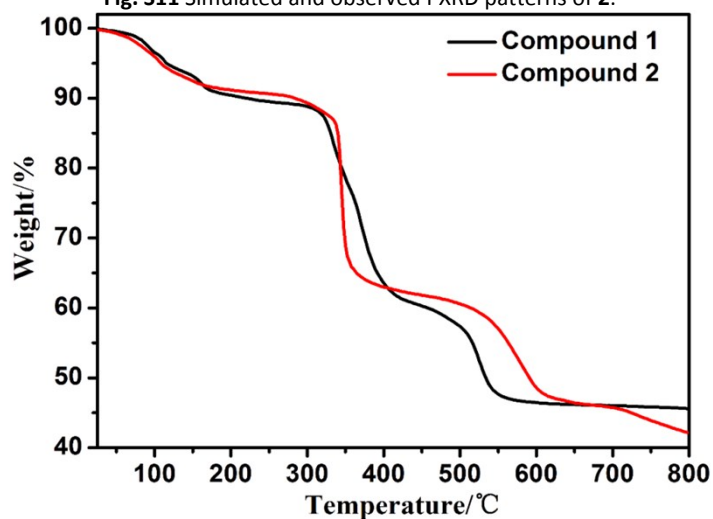


Fig. S12 Thermogravimetric curves for compounds 1 and 2.

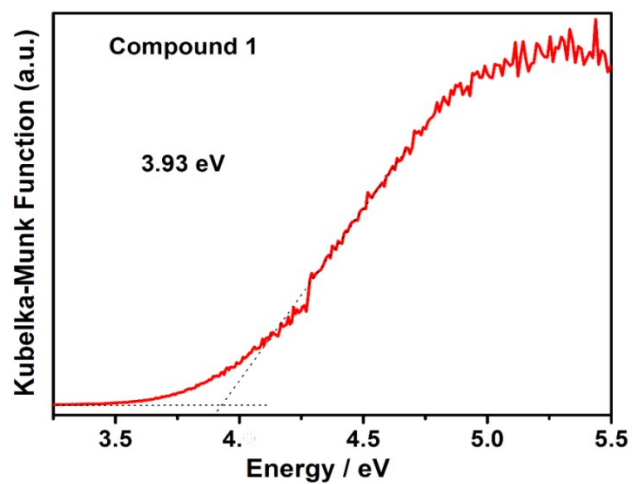


Fig. S13 UV-Vis spectrum of compound 1.

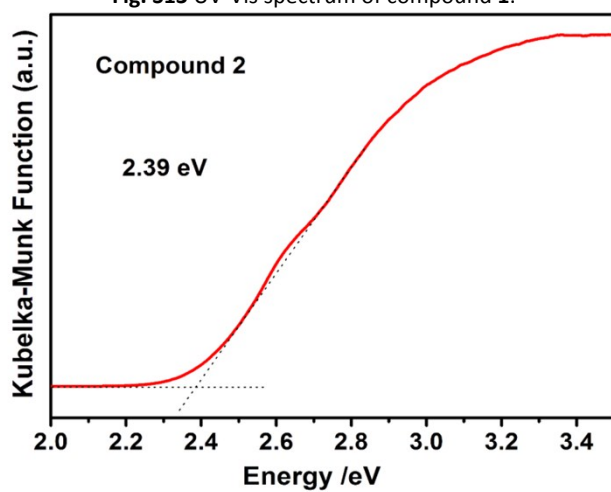


Fig. S14 UV-Vis spectrum of compound 2.

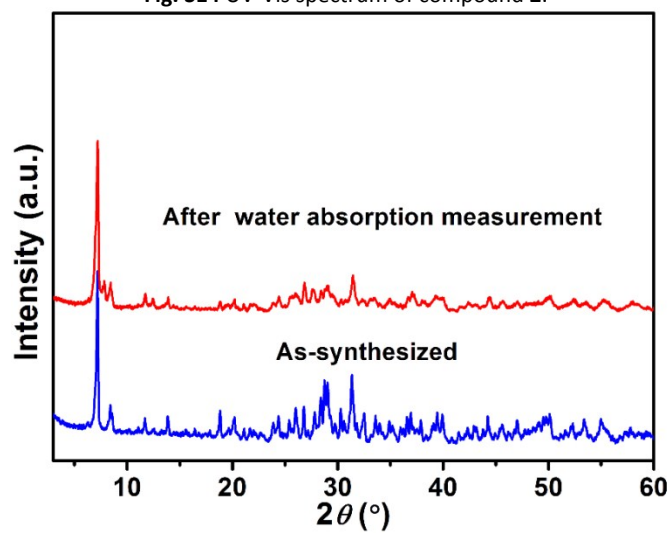


Fig. S15 PXRD patterns for samples of as-synthesize 1 and that after water absorption measurement.

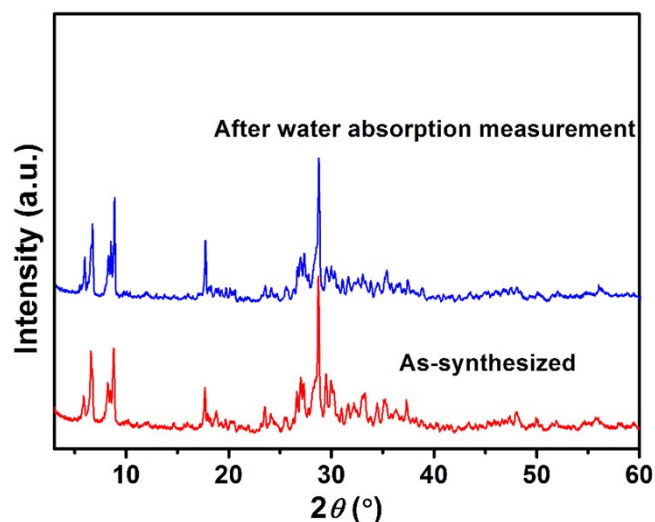
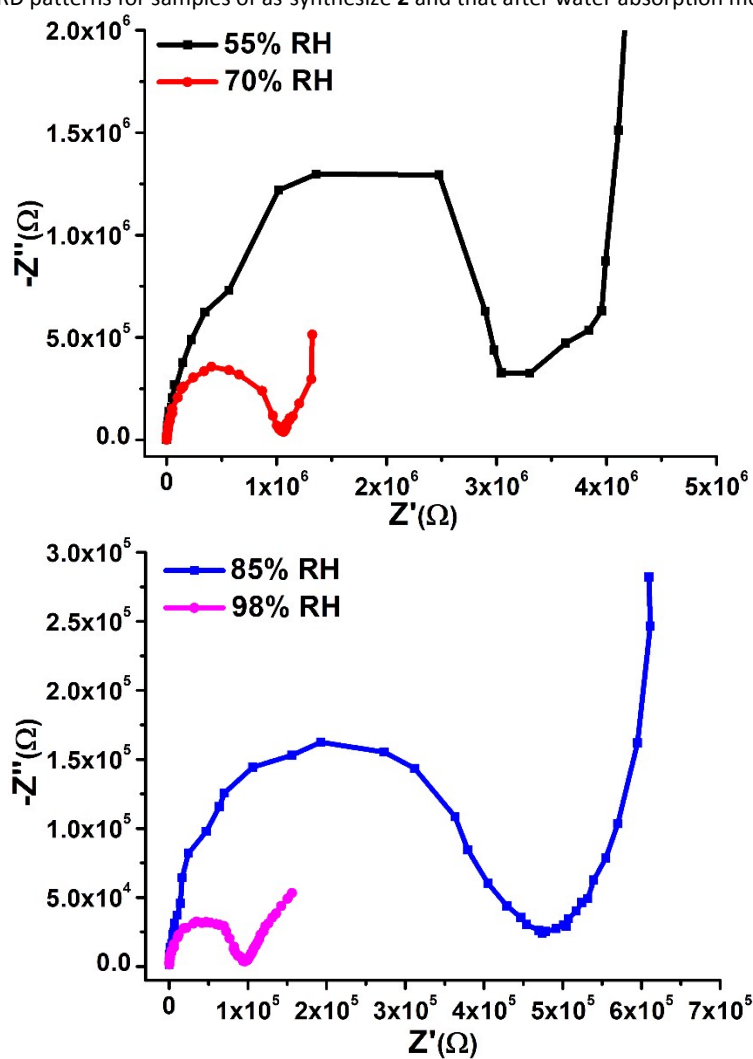


Fig. S16 PXRD patterns for samples of as-synthesize 2 and that after water absorption measurement.



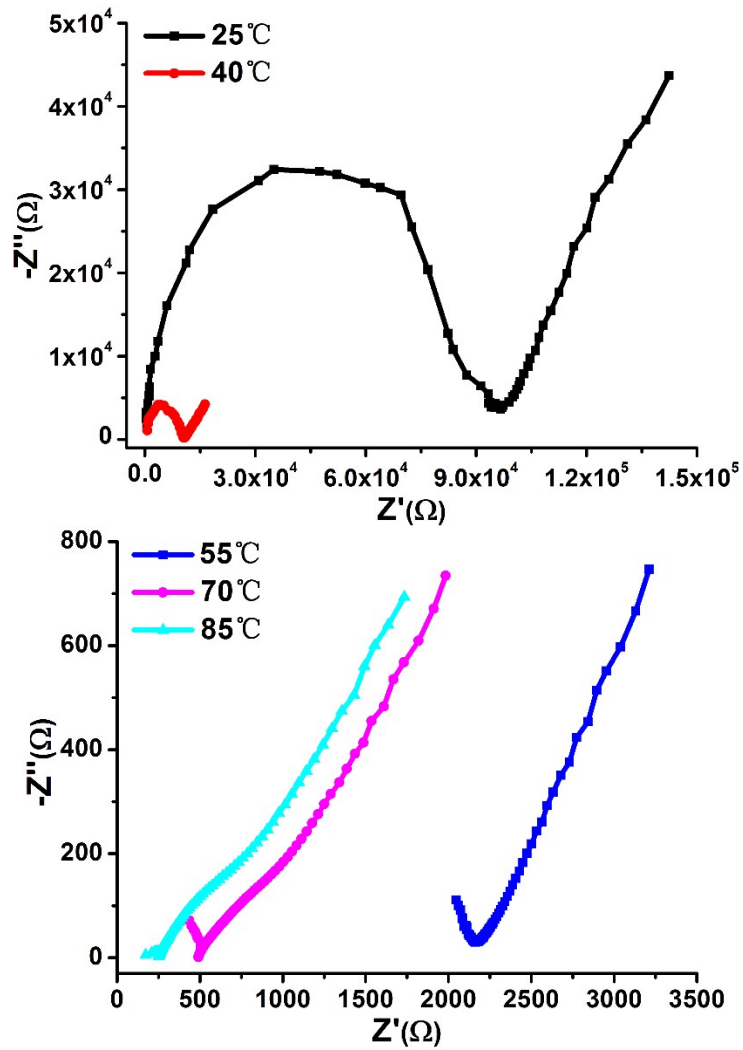
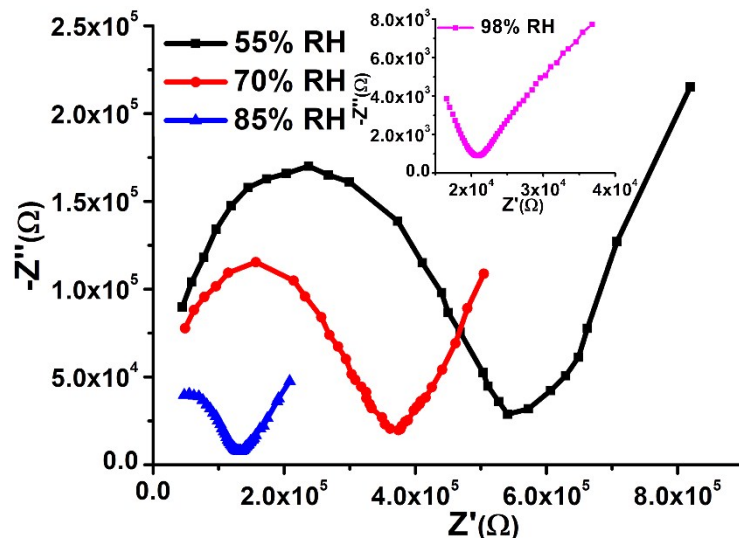


Fig. S17 Impedance spectra of complex 1 under different relative humidities at 25 °C and different temperature conditions at 98% RH.





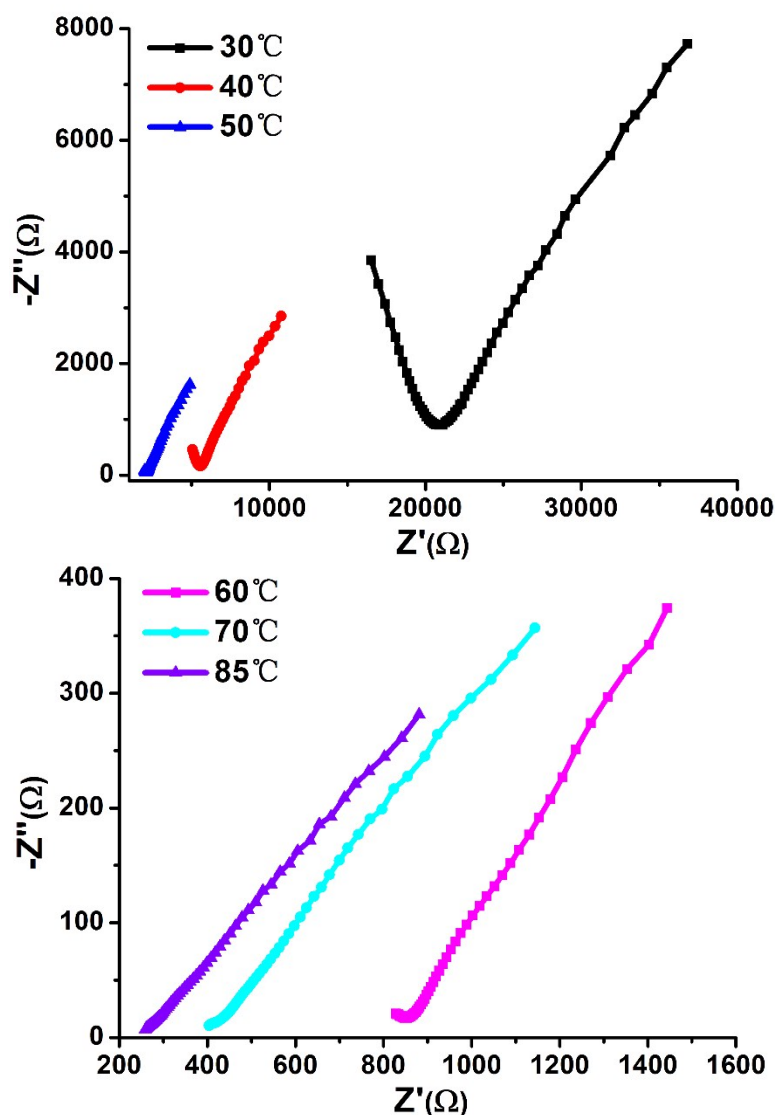


Fig. S18 Impedance spectra of complex **2** under different relative humidities at 30 °C and different temperature conditions at 98% RH.

Table S2 Proton conductivity ( $\sigma$ ) values of **1** at 25 °C and **2** at 30 °C under varied RH conditions.

Compound <b>1</b>				
RH %	55	70	85	98
$\sigma$ (S cm <sup>-1</sup> )	$1.85 \times 10^{-7}$	$5.74 \times 10^{-7}$	$1.29 \times 10^{-6}$	$6.50 \times 10^{-6}$
Compound <b>2</b>				
RH %	55	70	85	98
$\sigma$ (S cm <sup>-1</sup> )	$1.41 \times 10^{-6}$	$2.04 \times 10^{-6}$	$5.68 \times 10^{-6}$	$3.66 \times 10^{-5}$

Table S3 Proton conductivity ( $\sigma$ ) values of **1** and **2** under 98% RH and at different temperatures.

Compound <b>1</b>						
T/°C	25	40	55	70	85	
$\sigma$ (S cm <sup>-1</sup> )	$6.50 \times 10^{-6}$	$5.72 \times 10^{-5}$	$2.83 \times 10^{-4}$	$1.25 \times 10^{-3}$	$2.43 \times 10^{-3}$	
Compound <b>2</b>						
T/°C	30	40	50	60	70	85
$\sigma$ (S cm <sup>-1</sup> )	$3.66 \times 10^{-5}$	$1.37 \times 10^{-4}$	$3.66 \times 10^{-4}$	$8.97 \times 10^{-4}$	$1.89 \times 10^{-3}$	$2.95 \times 10^{-3}$