

Supporting information

Efficient proton conduction of a cerium(IV) metal-organic framework built by 3,5-pyrazoledicarboxylic acid

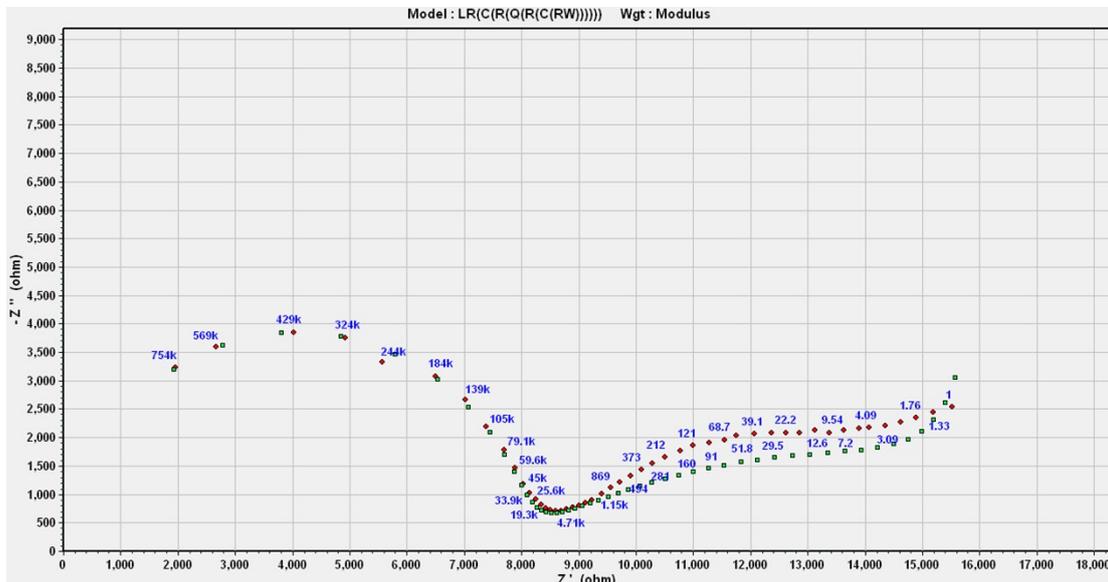
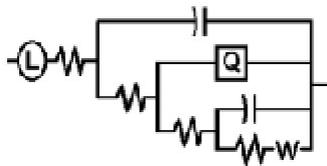
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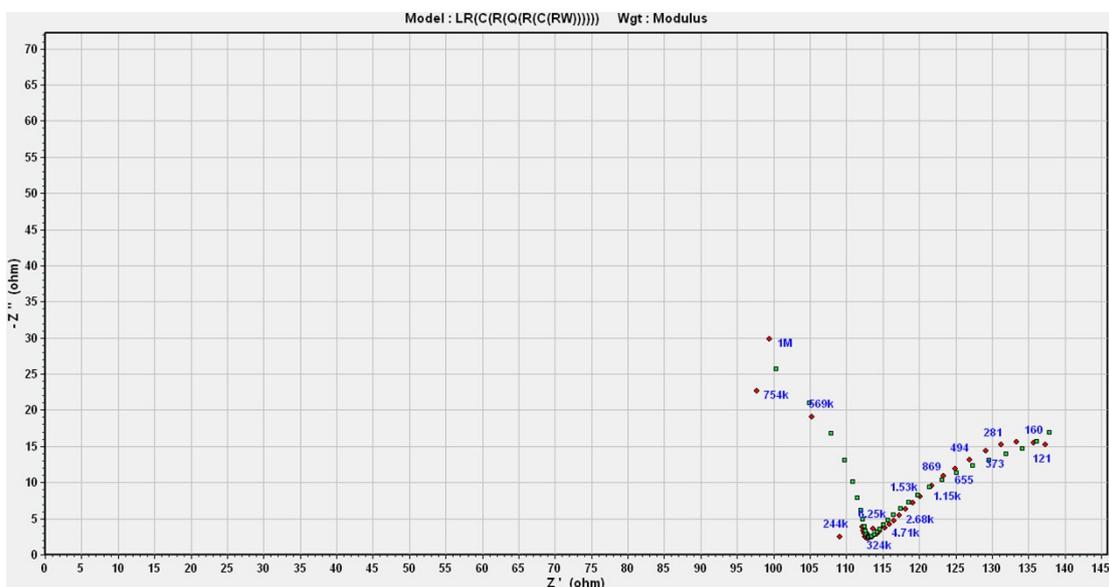
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Equivalent circuit LR(C(R(Q(R(C(RW))))))):



(a)



(b)

Fig. S1. Nyquist plots **1** under 30 °C (a) and 100 °C (b) at 98% RH. Red circle and green square are the measured impedance spectroscopy values and the fits of the impedance data to the equivalent circuit of LR(C(R(Q(R(C(RW)))))).

Note: In the above equivalent circuits, L, Q, R, C, and W represent the inductor, bipolar junction transistor, resistor, capacitor, and Warburg impedance, respectively.

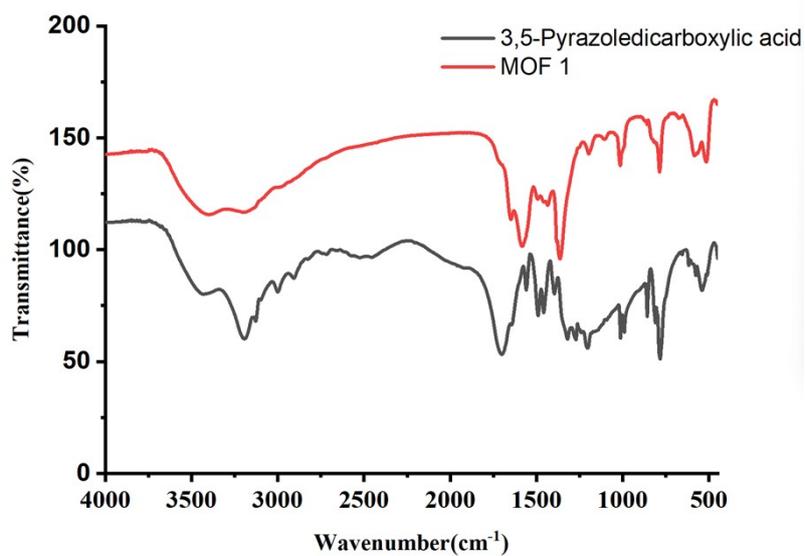


Fig. S2. FT-IR spectra of **1** and the organic ligand.

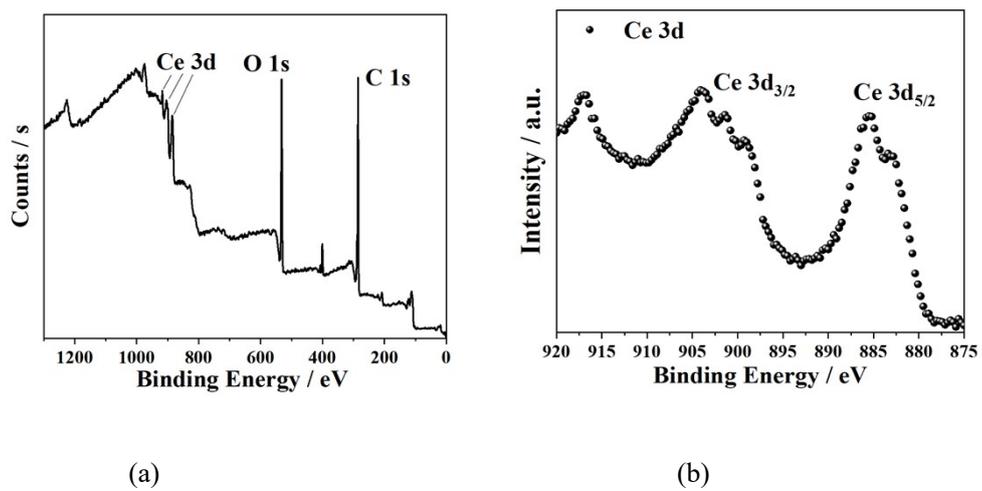


Fig. S3. (a) High-resolution XPS spectrum of **1**; (b) 3d spectrum of Ce.

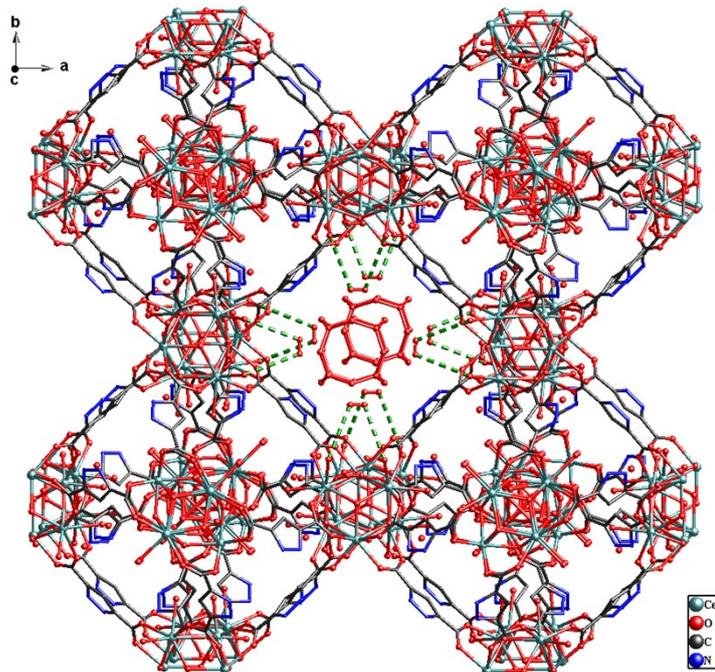


Fig. S4. The H-bonding system inside the framework of **1**.

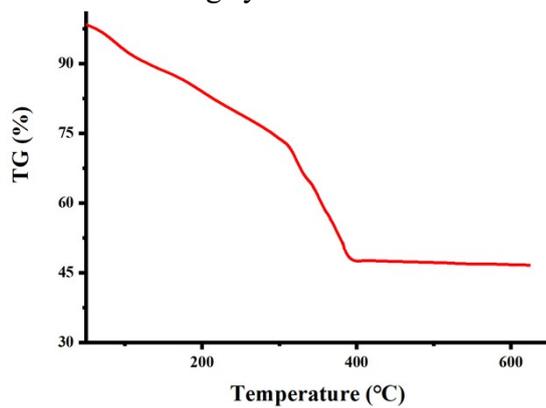


Fig. S5. The TG curve of **1**.

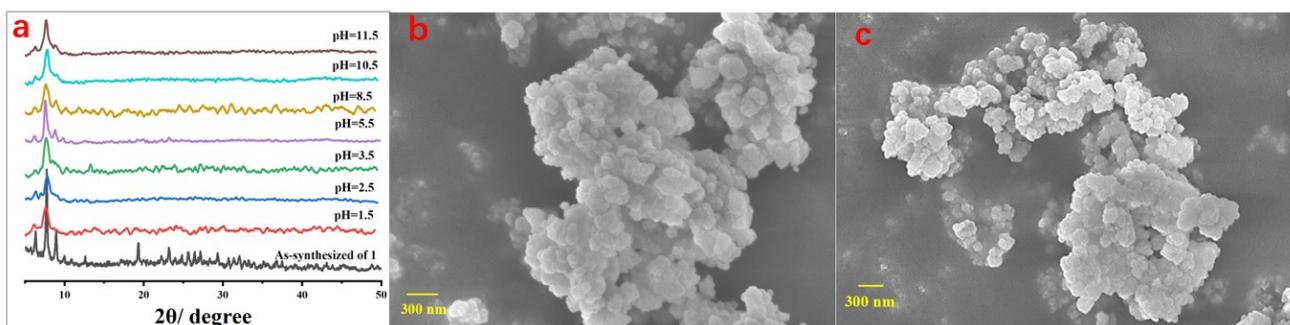


Fig. S6. PXRD patterns of **1** soaked in different pH solutions; SEM photos of **1** treated with acid (b) or base (c) solutions.

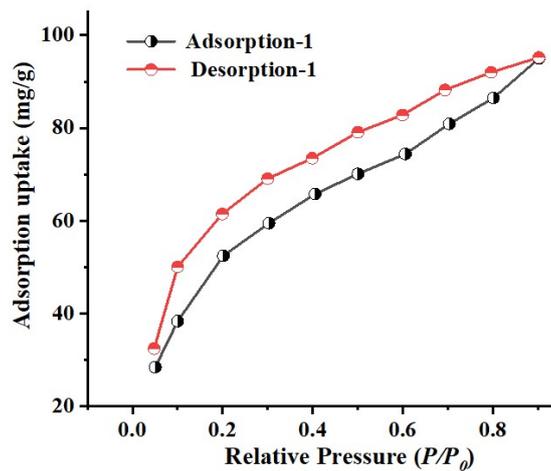


Fig. S7. Water vapor adsorption/desorption isotherms of MOF 1.

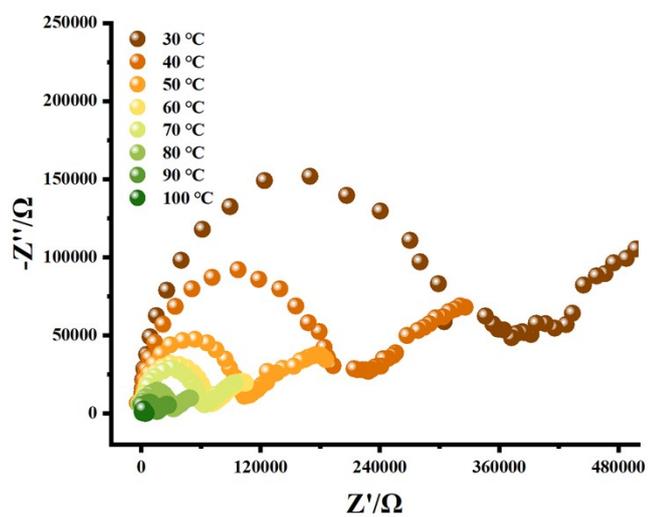


Fig. S8. The Nyquist spectra of 1 under 68% RH and 30-100 °C.

Table S1 The proton conductivity ($S \cdot \text{cm}^{-1}$) of **1** at 68% - 98% RHs and 30 - 100 °C

	68% RH ^a	75% RH ^a	85% RH ^a	93% RH ^a	98% RH ^a
30 °C ^b	7.68×10^{-7}	1.05×10^{-6}	1.70×10^{-6}	7.23×10^{-6}	6.11×10^{-5}
40 °C ^b	1.88×10^{-6}	2.94×10^{-6}	4.44×10^{-6}	1.42×10^{-5}	7.29×10^{-5}
50 °C ^b	3.82×10^{-6}	4.95×10^{-6}	1.13×10^{-5}	2.55×10^{-5}	1.10×10^{-4}
60 °C ^b	5.62×10^{-6}	1.08×10^{-5}	2.30×10^{-5}	4.67×10^{-5}	1.64×10^{-4}
70 °C ^b	8.50×10^{-6}	1.87×10^{-5}	3.95×10^{-5}	7.49×10^{-5}	2.34×10^{-4}
80 °C ^b	1.60×10^{-5}	4.44×10^{-5}	5.82×10^{-5}	1.47×10^{-4}	4.23×10^{-4}
90 °C ^b	4.21×10^{-5}	6.52×10^{-5}	1.33×10^{-4}	4.71×10^{-4}	1.62×10^{-3}
100 °C ^b	7.58×10^{-5}	1.76×10^{-4}	2.91×10^{-4}	9.21×10^{-4}	1.96×10^{-2}

^a Relative humidity; ^b Temperature