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Electronic Supplementary Information

Phosphonic Acid Functionalized Silicas for Intermediate Temperature Proton Conduction

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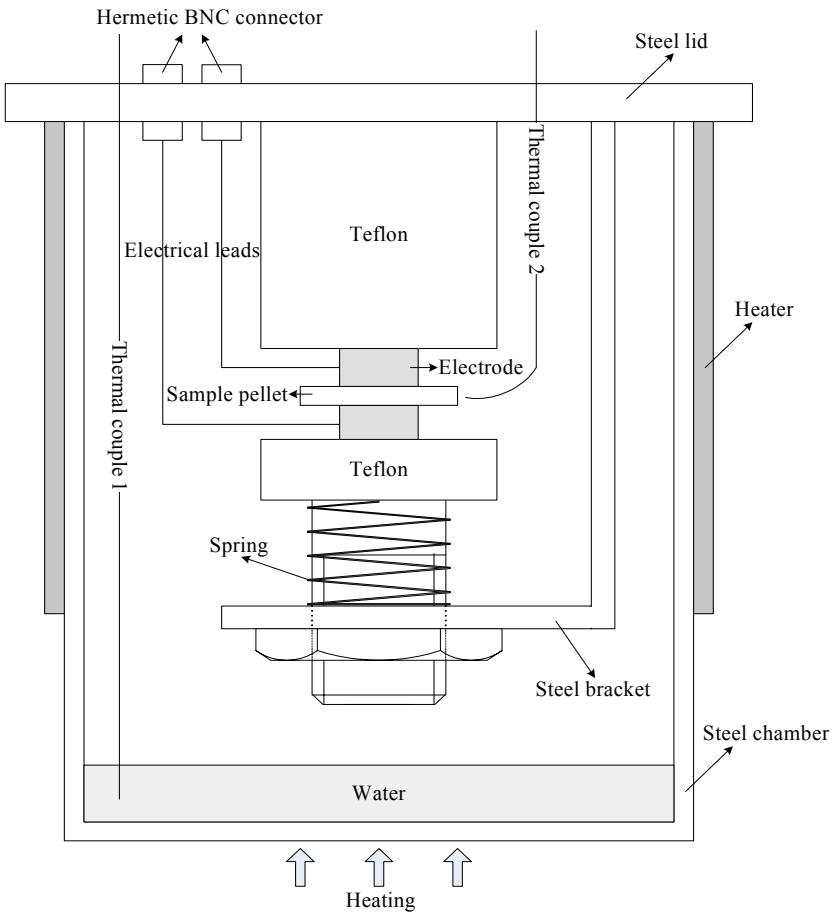

Fig. S1 Scheme of proton conductivity test cell.

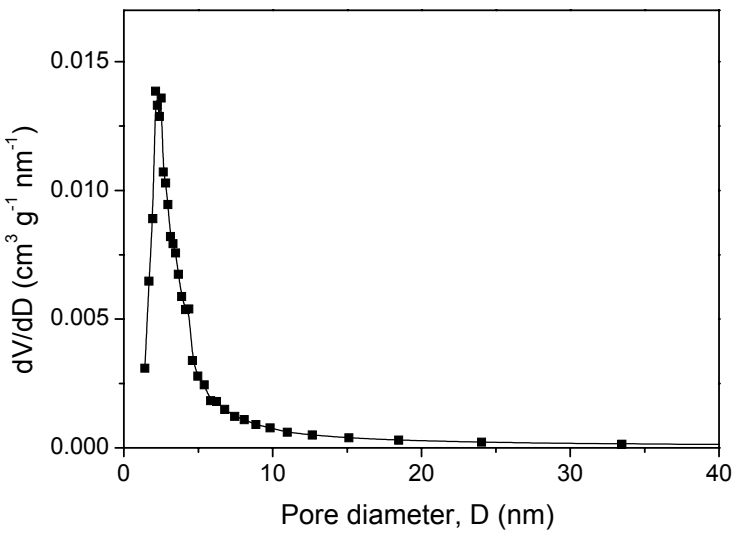

Fig. S2 BJH pore size distribution of sample 3D7TH.

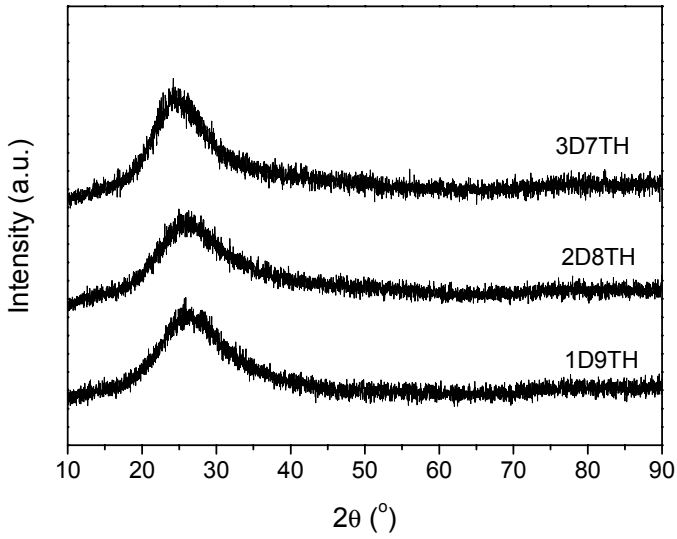

Fig. S3 XRD patterns of acidified silica gels.

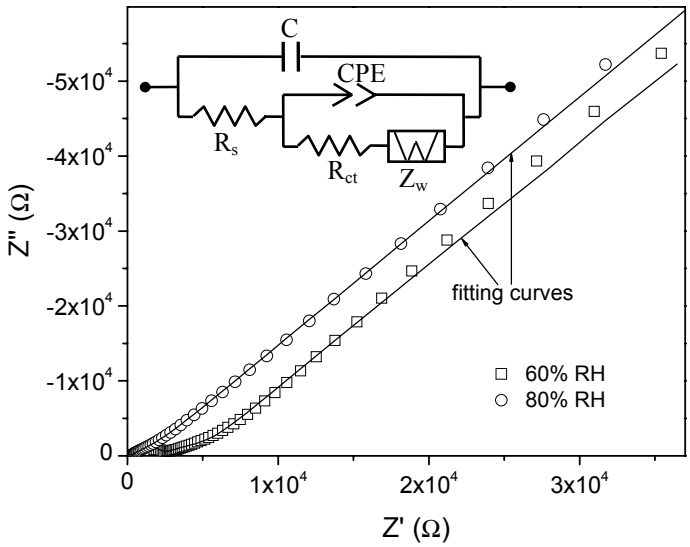

Fig. S4 Example fittings of a.c. impedance spectra for 1D9TH measured at 150 ^{o}C and at 60% and 80% RH using an equivalent circuit as shown in the inset. The equivalent circuit consists of a parallel resistor-capacitor pair (R_s-C) and a second R_{ct}-CPE (constant phase element) pair with a Warburg finite length element (Z_w) reflecting the linear response at LF. The resistor R_s represents the bulk resistance of the sample, and the second pair corresponds to the electrode/sample interfacial impedance, in which CPE is used to better present the depressed arc than the conventional RC element.

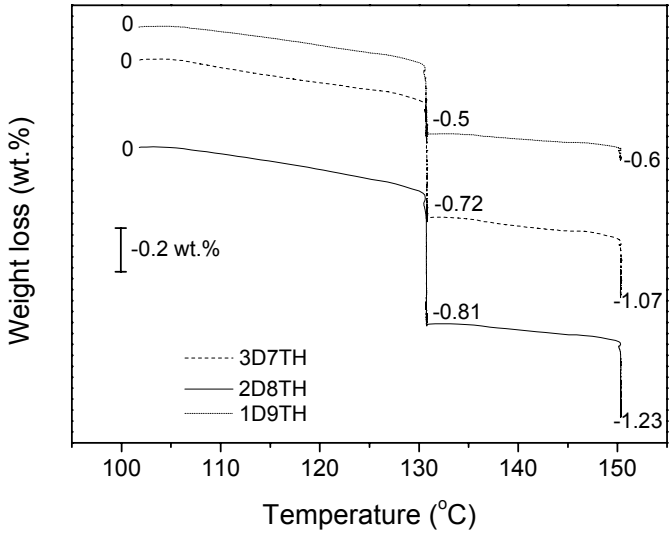

Fig. S5 Thermogravimetric analysis (TGA) curves of acidified silica gels in a dry nitrogen atmosphere. Prior to measuring the dehydration at above 100 ^{o}C, each sample was kept at 100 ^{o}C for 5 h. Then the sample was heated at 5 ^{o}C min^{-1} to 130 ^{o}C and subsequently to 150 ^{o}C. At each temperature, the sample was kept for 5 h to study its dehydration.