Supporting Information

Heterogeneous hybrid of propyl amino functionalized MCM-41 and 1H-1,2,4-triazole for high efficient intermediate temperature proton conductor

Zhenzhen Wu, Juan Li*, Xian-Ming Zhang*

Institute of Crystalline Materials, School of Chemistry & Chemical Engineering, & Institute of Molecular Science, Shanxi University, Taiyuan 030006, PR China

* lj0511@sxu.edu.cn, zhangxm@dns.sxnu.edu.cn

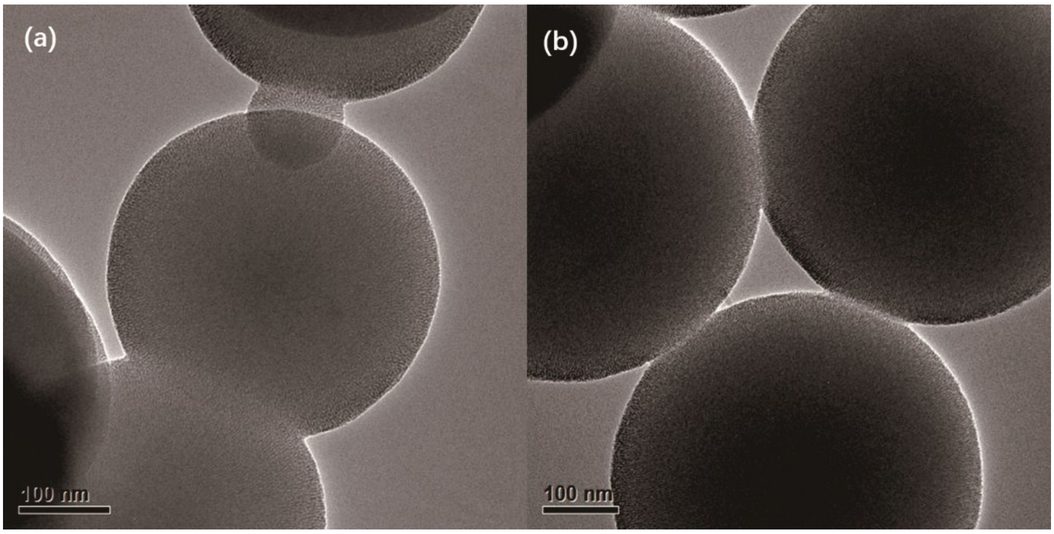

Figure S1. TEM images of MS-$PrNH_2$-2 (a) and Tri@MS-$PrNH_2$-2

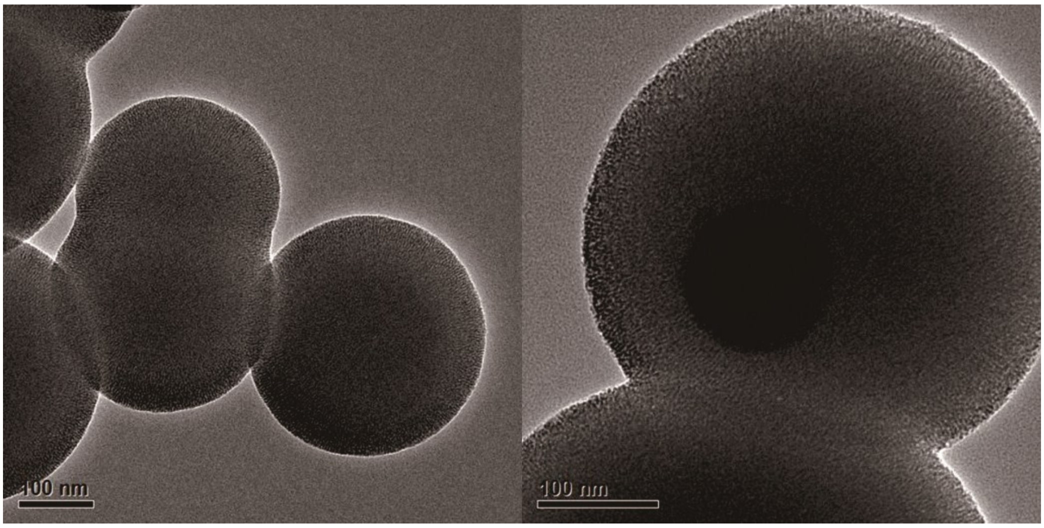

Figure S2. TEM images of MS-$PrNH_2$-3 and Tri@MS-$PrNH_2$-3

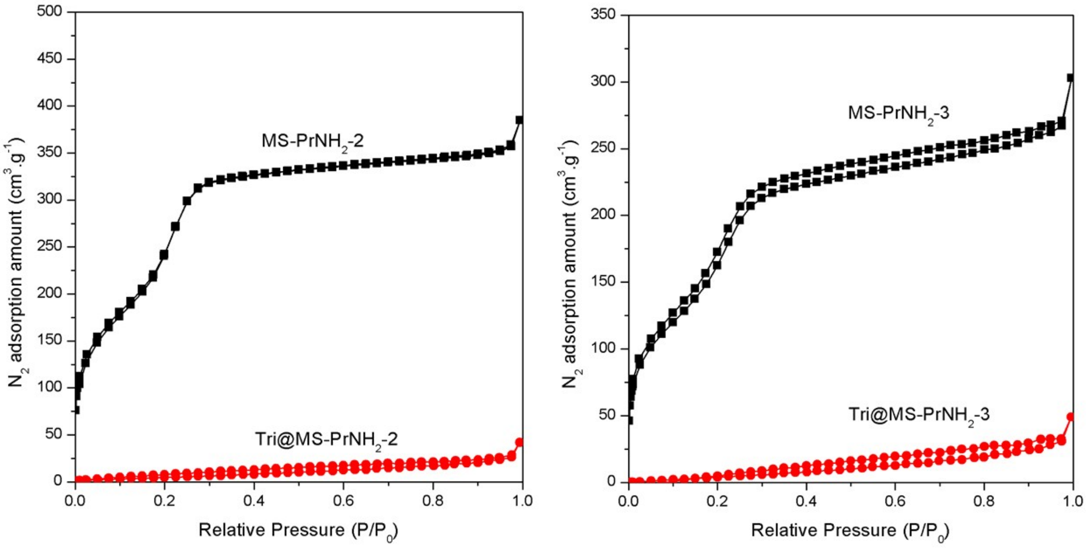

Figure S3. N_2 adsorption isotherms of MS-PrNH_2-2, Tri@MS-PrNH_2-2, MS-PrNH_2-3 and Tri@MS-PrNH_2-3

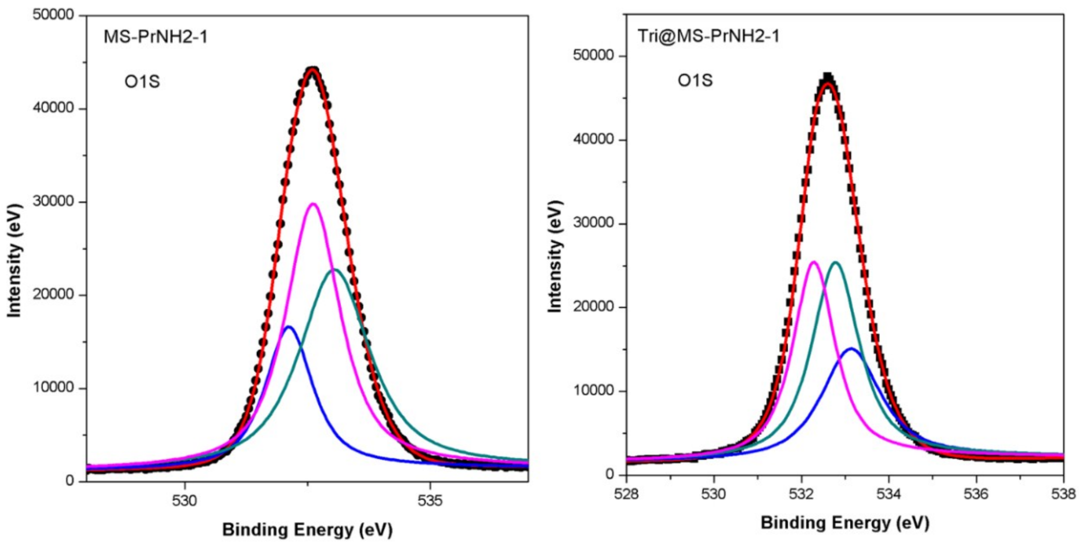

Figure S4. O 1s X-ray photoelectron spectroscopy of MS-PrNH_2-1 and Tri@MS-PrNH_2-1.

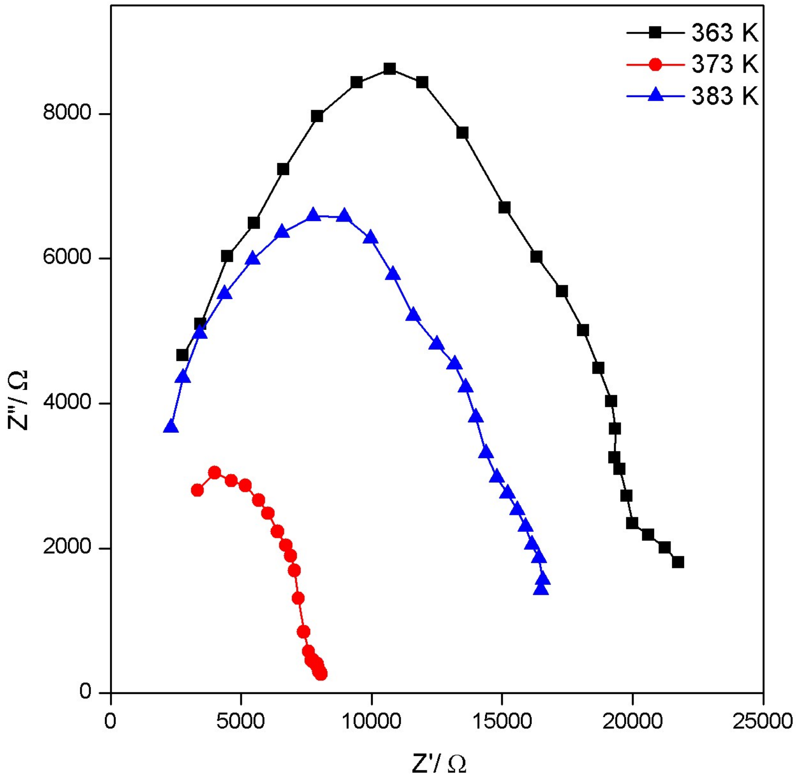

Figure S5. The Nyquist plots of MCM-41 loaded with 1H-1,2,4-triazole

Table S1. Comparison of proton conductivity of Tri@MS-PrNH$_2$-1 with the reported porous materials.

Materials	Conductivity (S/cm)	Ea (eV)	Measurement Conditions	Ref
His@[Al(OH)(ndc)]$_n$	1.7×10^{-3}	0.25	Anhydrous, 150°C	*Angew. Chem. Int. Ed.* 2011, 50, 11706
β-PCMOF-2(Tz)$_{0.45}$	5.0×10^{-4}	0.34	Anhydrous, 150◦C	*Nat. Chem.* 2009,1,75
In-IA-2D-2	1.2×10^{-5}	0.48	Anhydrous, 90◦C	*Chem. Commun.* 2013,49,6197
Im@{Al(μ2-OH)(1,4-bdc)}$_n$	2.2×10^{-5}	0.90	Anhydrous, 120◦C	*Nat. Mater.* 2009,8,831
[ImH$_2$][Cu(H$_2$PO$_4$)$_{1.5}$(HPO$_4$)$_{0.5}$•Cl$_{0.5}$]	2.0×10^{-2}	1.10	Anhydrous, 130◦C	*Chem. Commun.* . 2014,50,10241
PA@Tp-Azo	6.7×10^{-5}	0.11	Anhydrous, 67◦C	*J. Am. Chem. Soc.* 2014,136,6570
[Zn$_3$(H$_2$PO$_4$)$_6$](Hbim)	1.3×10^{-3}	0.50	Anhydrous, 120◦C	*J. Am. Chem. Soc.* 2013,135,11345
Im@Td-PPI 2	3.49×10^{-4}	0.30	Anhydrous,	*J. Am. Chem. Soc.*

			90◦C	2015,137,913
$[Zn(HPO_4)(H_2PO_4)_2](ImH_2)_2$	2.5×10^{-4}	0.47	Anhydrous, 130◦C	*J. Am. Chem. Soc.* 2012,134,7612
Tri@MS-NH$_2$-1	***8.34×10^{-3}***	***0.55(< 80 ◦C) 1.303(80~120 ◦C)***	***Anhydrous, 120^{o}C***	***This work***
Tri@MS-NH$_2$-2	***2.68×10^{-3}***	***0.48(< 80 ◦C) 1.159(80~120◦C)***	***Anhydrous, 120^{o}C***	***This work***
Tri@MS-NH$_2$-3	***7.29×10^{-4}***	***0.40(< 80 ◦C) 0.937(80~120◦C)***	***Anhydrous, 120^{o}C***	***This work***