Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Amine post-functionalized POSS-based porous polymers exhibiting simultaneously enhanced porosity and carbon dioxide adsorption properties

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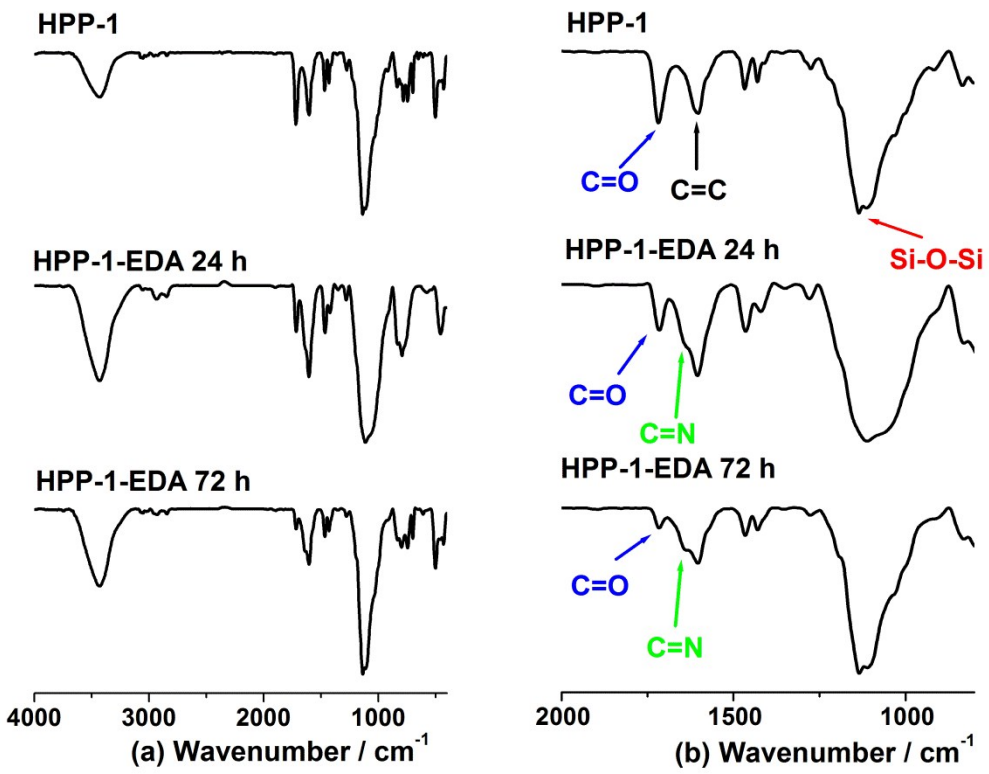

Fig. S1. (a) The FT-IR spectra of HPP-1, HPP-1-EDA at 24 h and 72 h; (b) the FT-IR spectra were enlarged from 2000 cm^{-1} to 800 cm^{-1}

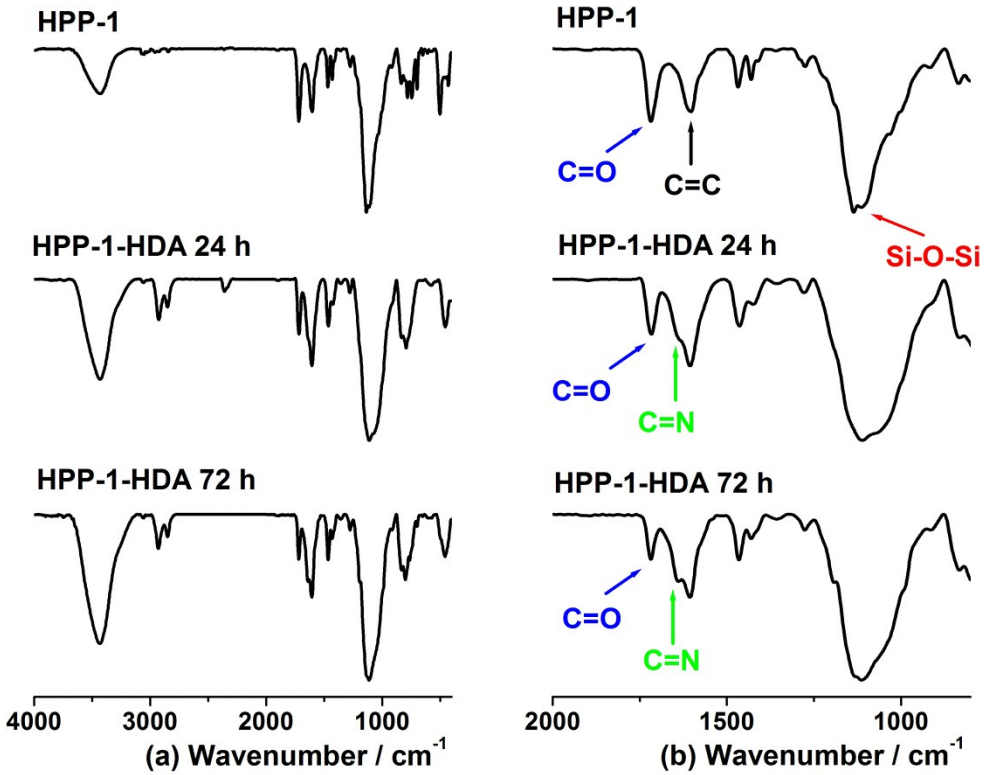

Fig. S2. (a) The FT-IR spectra of HPP-1, HPP-1-HDA at 24 h and 72 h; (b) the FT-IR spectra were enlarged from 2000 cm^{-1} to 800 cm^{-1}

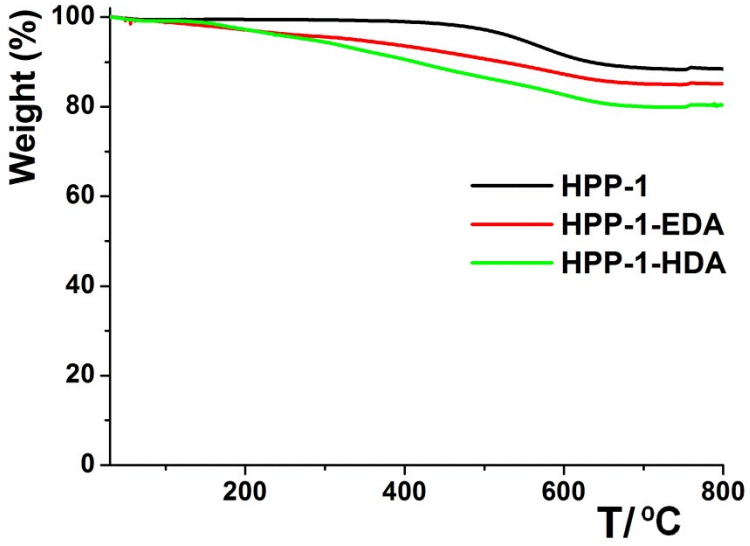

Fig. S3. TGA curves of HPP-1, HPP-1-EDA and HPP-1-HDA under N_2 at 10 °C min^{-1} from 30°C to 800°C

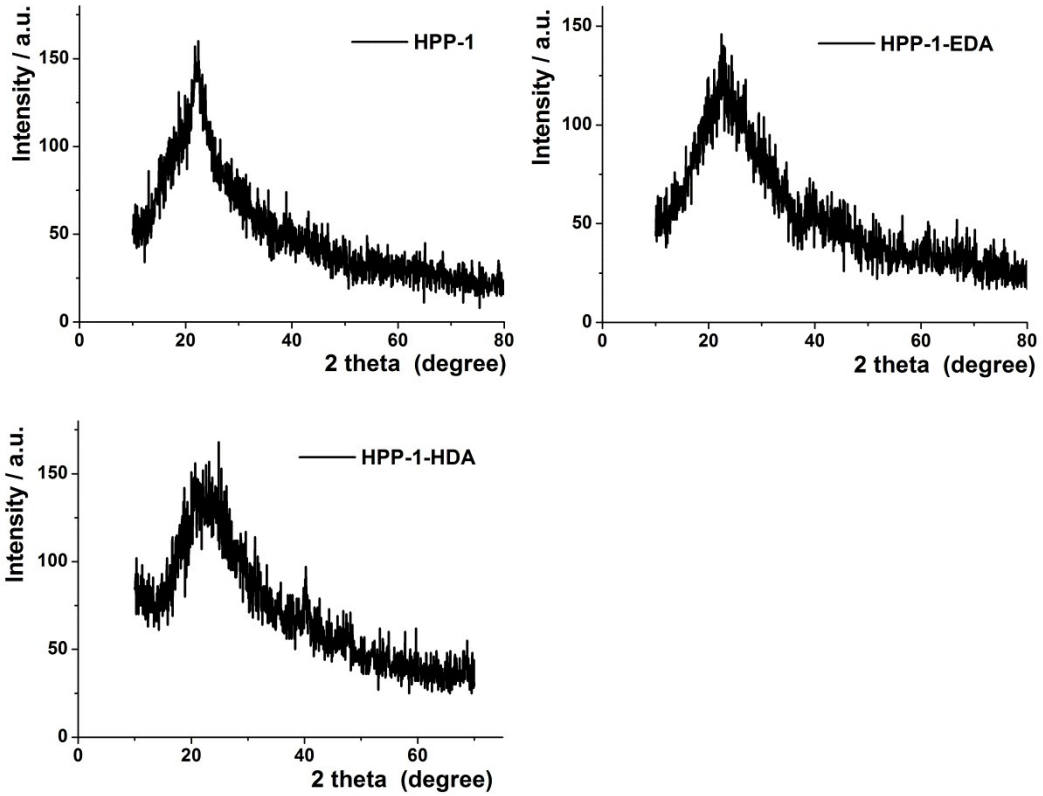

Fig. S4 XRD patterns of HPP-1, HPP-1-EDA and HPP-1-HDA

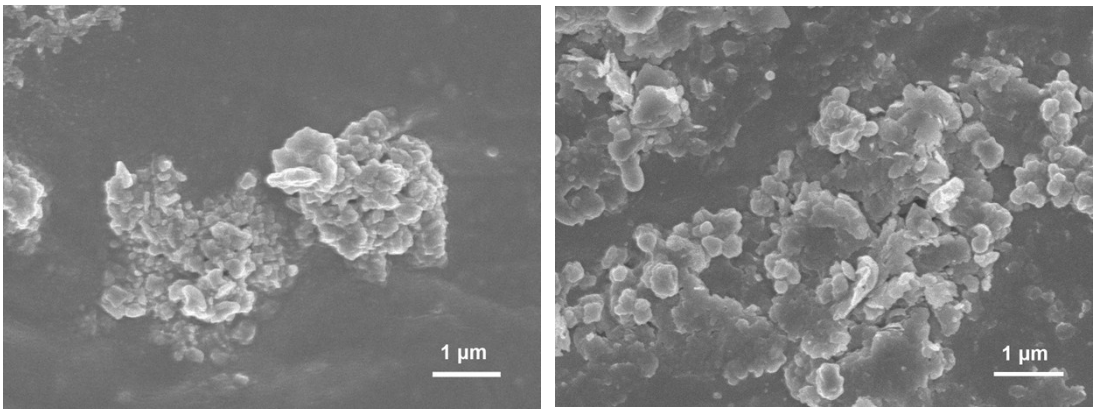

Fig. S5 FE-SEM images of HPP-1-EDA (left) and HPP-1-HDA (right)

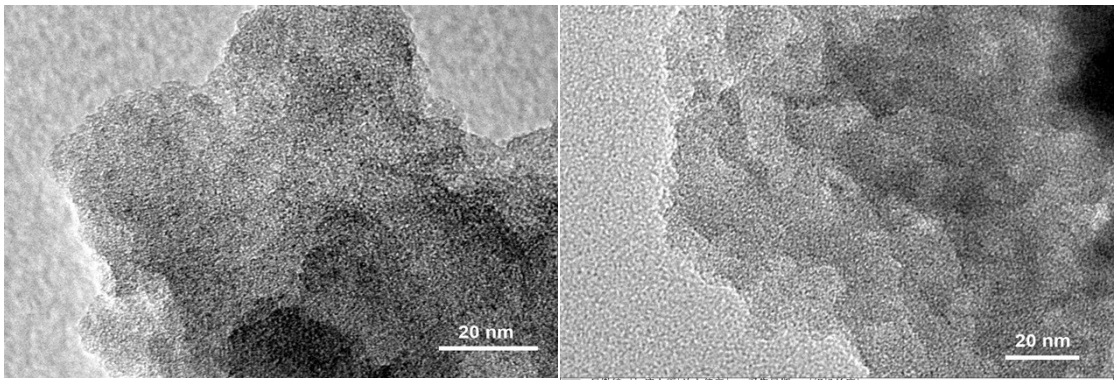

Fig. S6 HR-TEM images of HPP-1-EDA (left) and HPP-1-HDA (right)

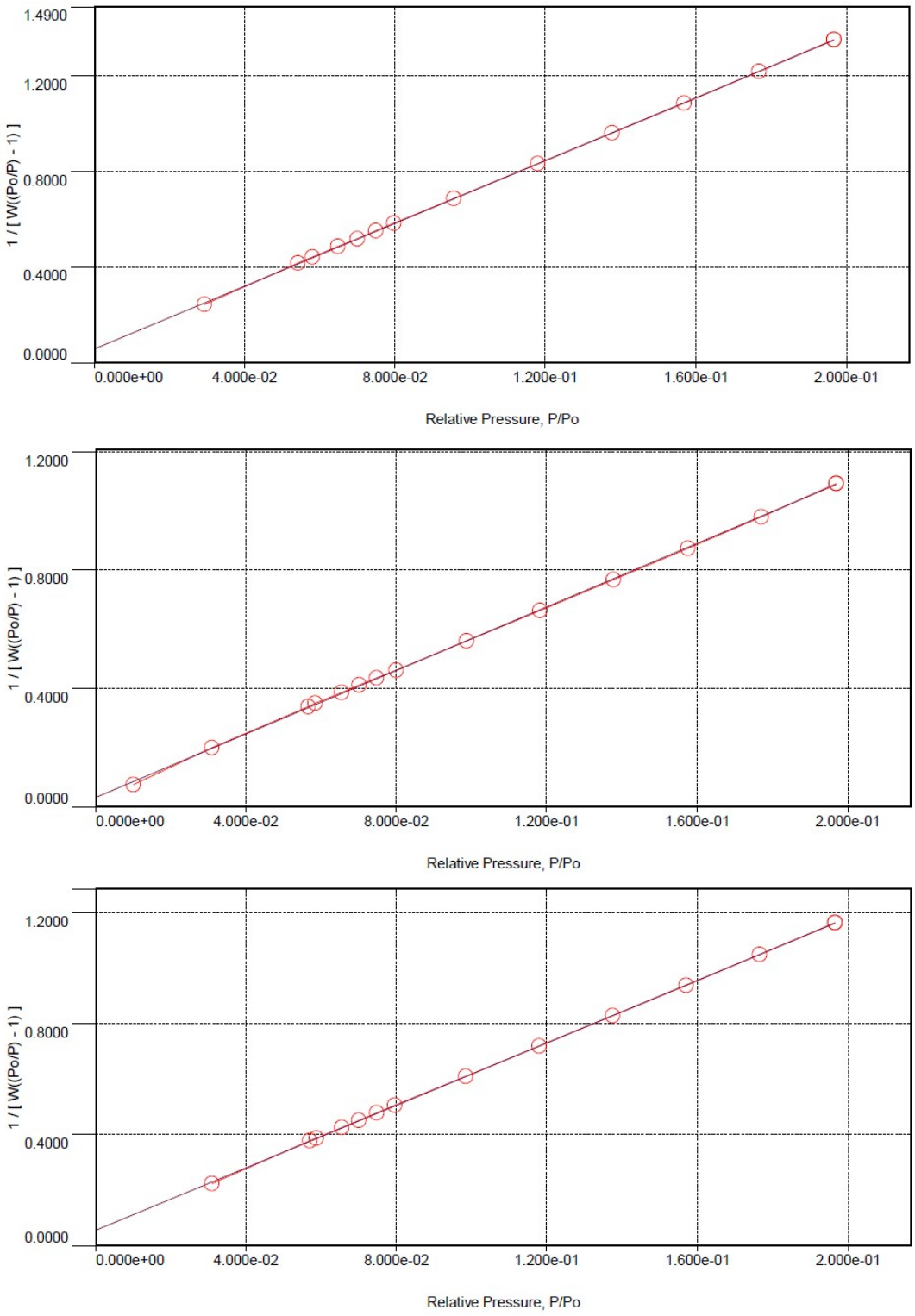

Fig. S7 BET plots of HPP-1 (top, r = 0.999970, C = 111.91), HPP-1-EDA (middle, r = 0.999910, C = 166.16) and HPP-1-HDA (bottom, r = 0.999992, C = 190.22)

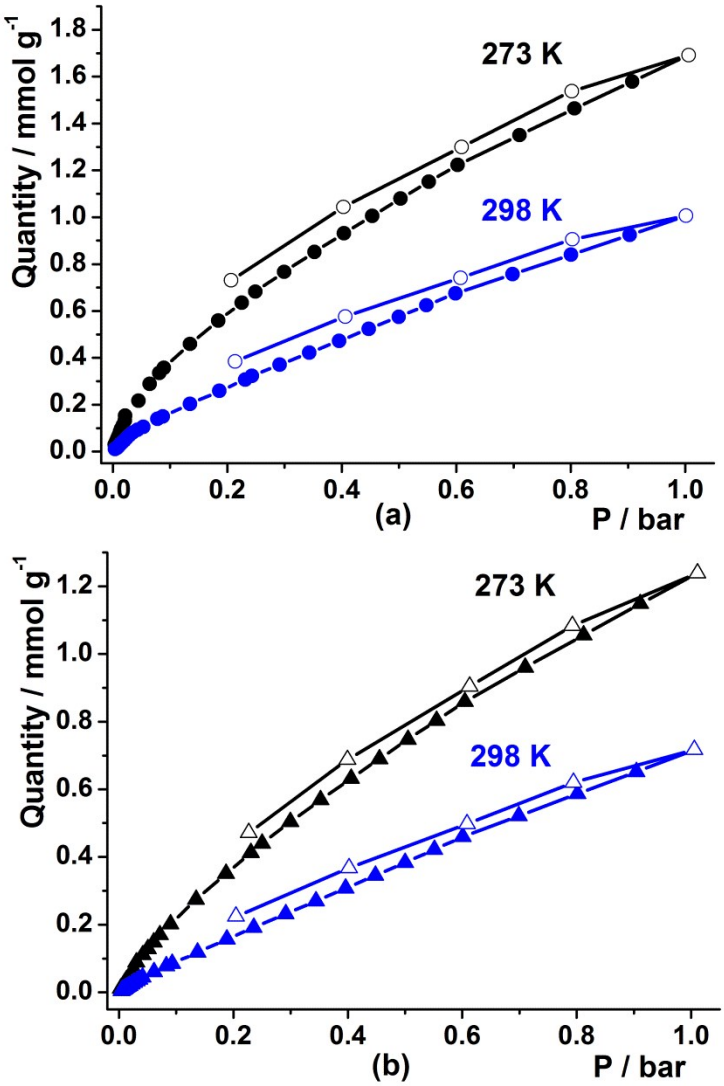

Fig. S8 CO_2 adsorption (closed symbols) and desorption (open symbols) isotherms of HPP-1-EDA and HPP-1-HDA at 273 K and 298 K

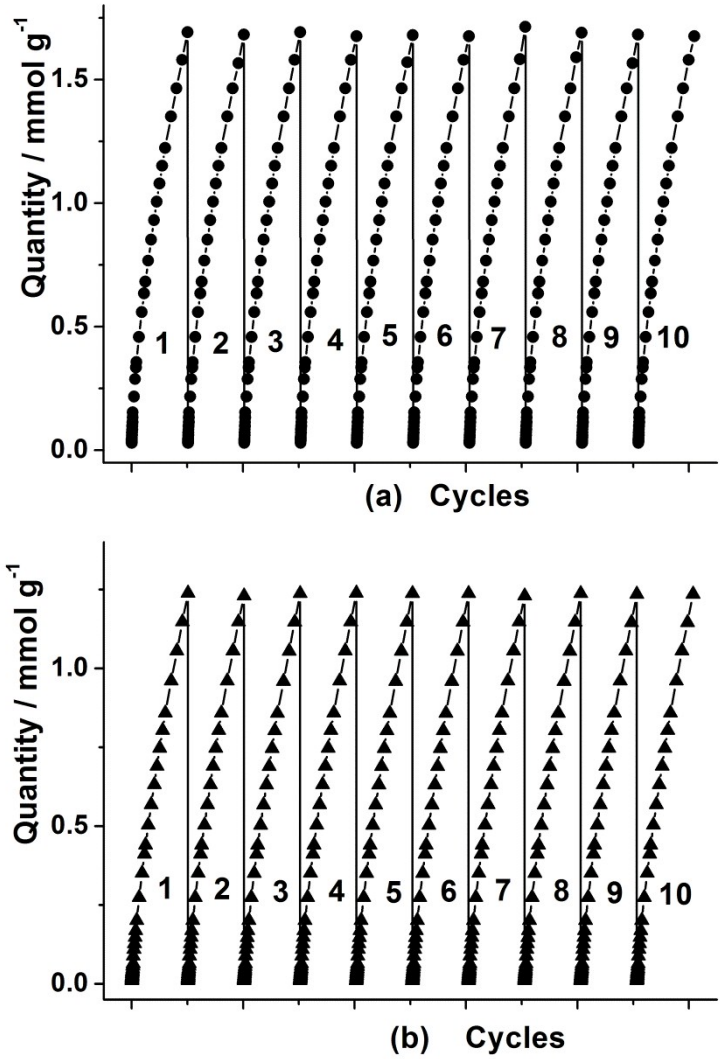

Fig. S9 Ten cycles of CO_2 uptakes of HPP-1-EDA (a) and HPP-1-HDA (b) at 273 K. After saturation, the sample was regenerated with a temperature swing to 80°C and then under vacuum.

Henry's Law selectivity of CO_2 over N_2 for HPP-1, HPP-1-EDA and HPP-1-HDA at 298 K

A nice fitting of CO_2 and N_2 isotherms has been calculated based on Toth isotherm model.[1,2]

$$q = q_{sat} \frac{b^{1/t} P}{(1 + b^t)^{1/t}}$$

where q is the uptake in mmol g^{-1}, q_{sat} is the saturation uptake in mmol g^{-1}, P is the pressure in torr, t and b are parameters which are specific for adsorbent pairs.

The Henry law constant K, quantifies the extent of the adsorption of a given adsorbate by a solid. The magnitude of K depends on the properties of both adsorbate and solid. For the Toth isotherm, the Henry law constant is defined by the following equation:

$$K = \lim_{P \to 0}(\frac{dq}{dP}) = b^{1/t} q_{sat}$$

Finally, the Henry's Law selectivity $S_{\alpha/\beta}$ of gas α over β is given by the following equation:

$$S_{\alpha/\beta} = \frac{K_\alpha}{K_\beta}$$

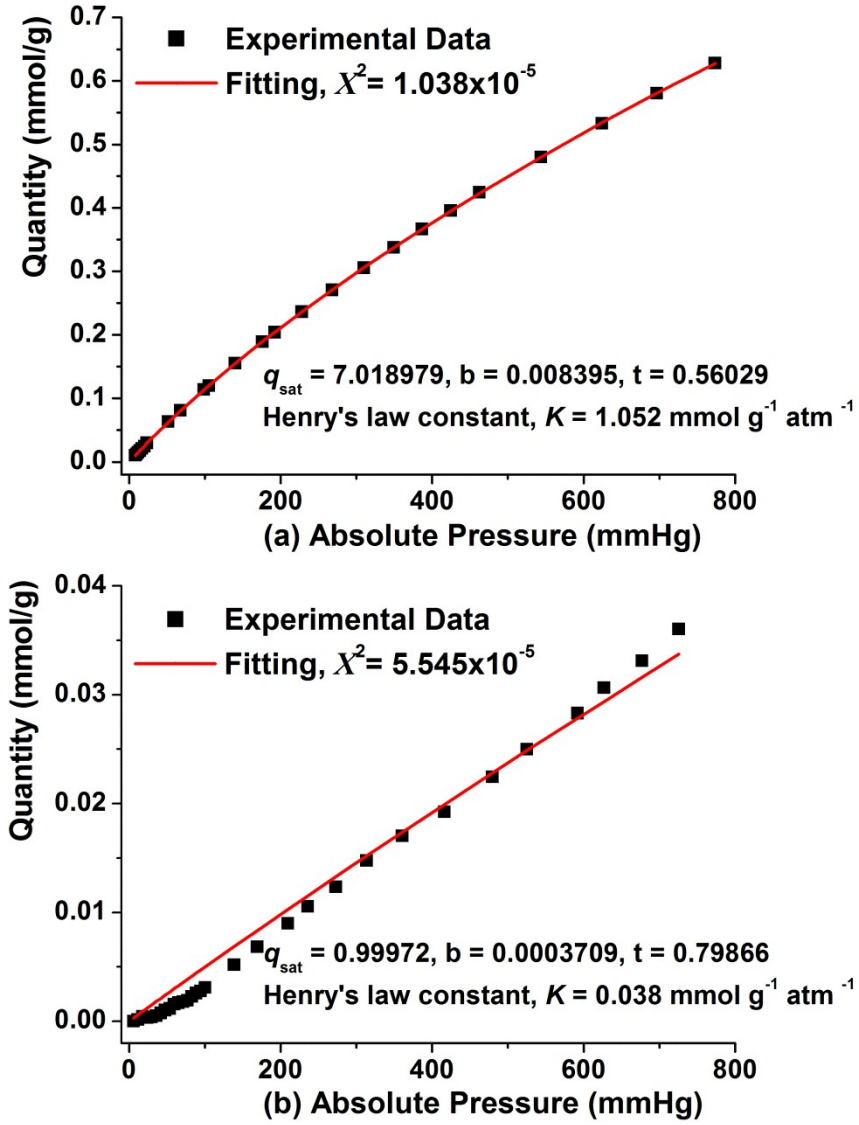

Fig. S10 Toth model fitting of CO_2 (a) and N_2 (b) adsorption isotherms of HPP-1 at

298 K

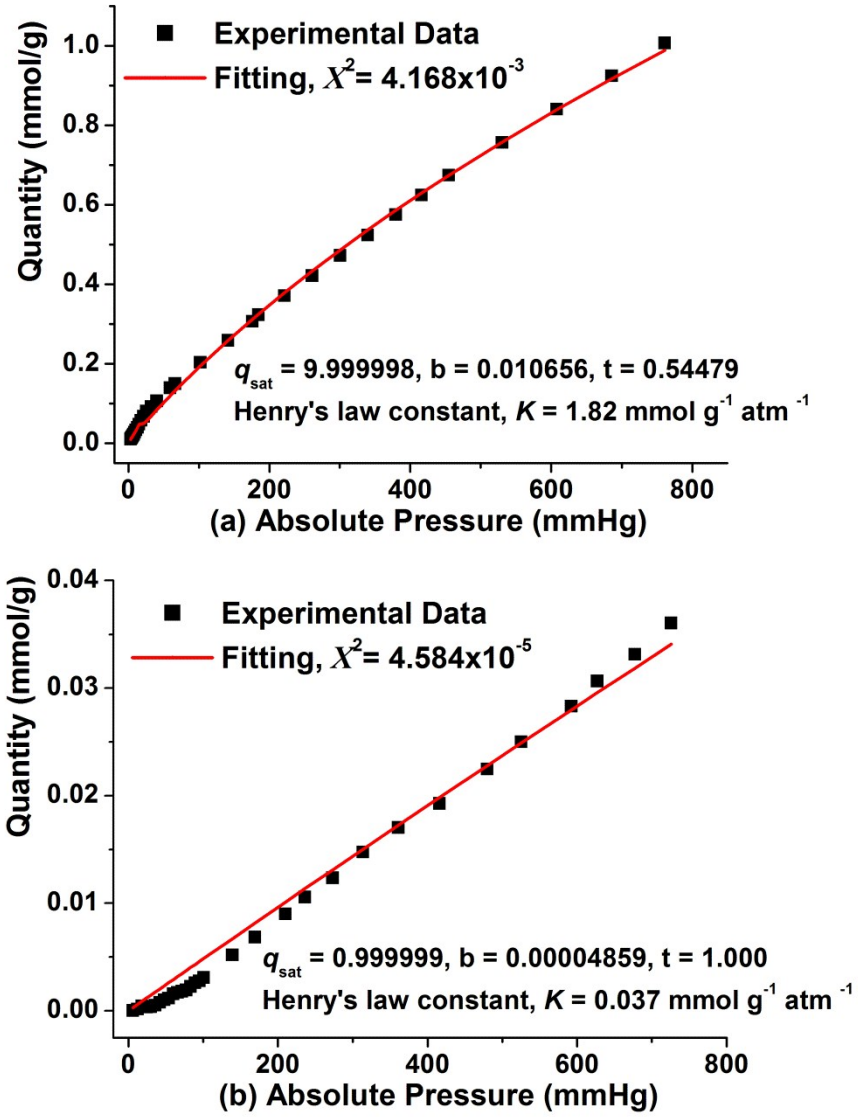

Fig. S11 Toth model fitting of CO_2 (a) and N_2 (b) adsorption isotherms of HPP-1-EDA at 298 K

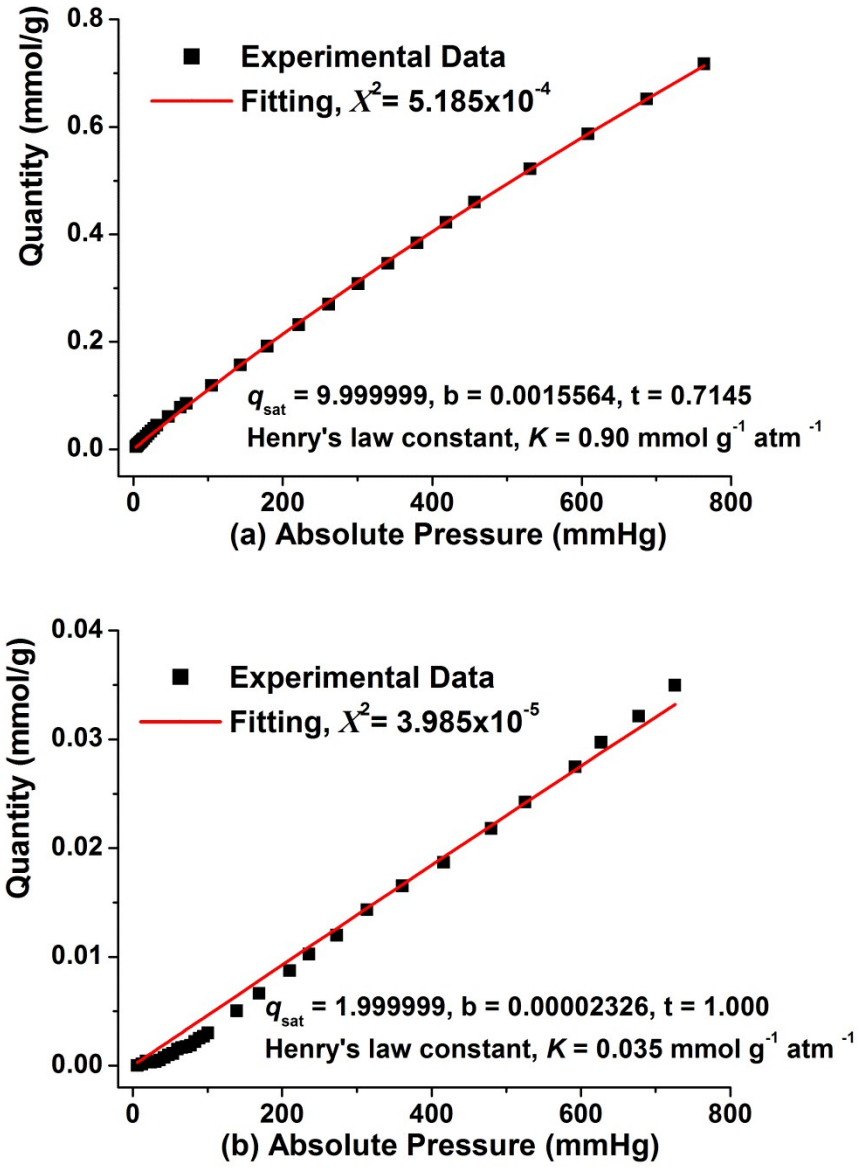

Fig. S12 Toth model fitting of CO_2 (a) and N_2 (b) adsorption isotherms of HPP-1-HDA at 298 K

References

[1] E. Neofotistou, C. D. Malliakas, P. N. Trikalitis, *Chem. Eur. J.*, 2009, **15**, 4523–4527.

[2] B. Wang, A. P. Côté, H. Furukawa, M. O'Keeffe, O. M. Yaghi, *Nature*, 2008, **453**, 207– 211.