Electronic Supplementary Information

Hybrid Networks Constructed from Tetrahedral Silicon-Centered Precursors and Cubic POSS-Based Building Blocks via Heck Reaction: Porosity, Gas Sorption, and Luminescence

Dengxu Wang,[a,b] Wenyan Yang,[a] Liguo Li,[a] Xian Zhao,[b] Shengyu Feng,*[a] and Hongzhi Liu*[a]

[a] Key Laboratory of Special Functional Aggregated Materials, Ministry of Education, School of Chemistry and Chemical Engineering, Shandong University, Jinan 250100, P. R. China

[b] State Key Lab of Crystal Materials, Shandong University, Jinan 250100, P. R. China

*Corresponding Author. Tel: +86 531 88364866. Fax: +86 531 88564464. E-mail: fsy@sdu.edu.cn; liuhongzhi@sdu.edu.cn

Table of contents:

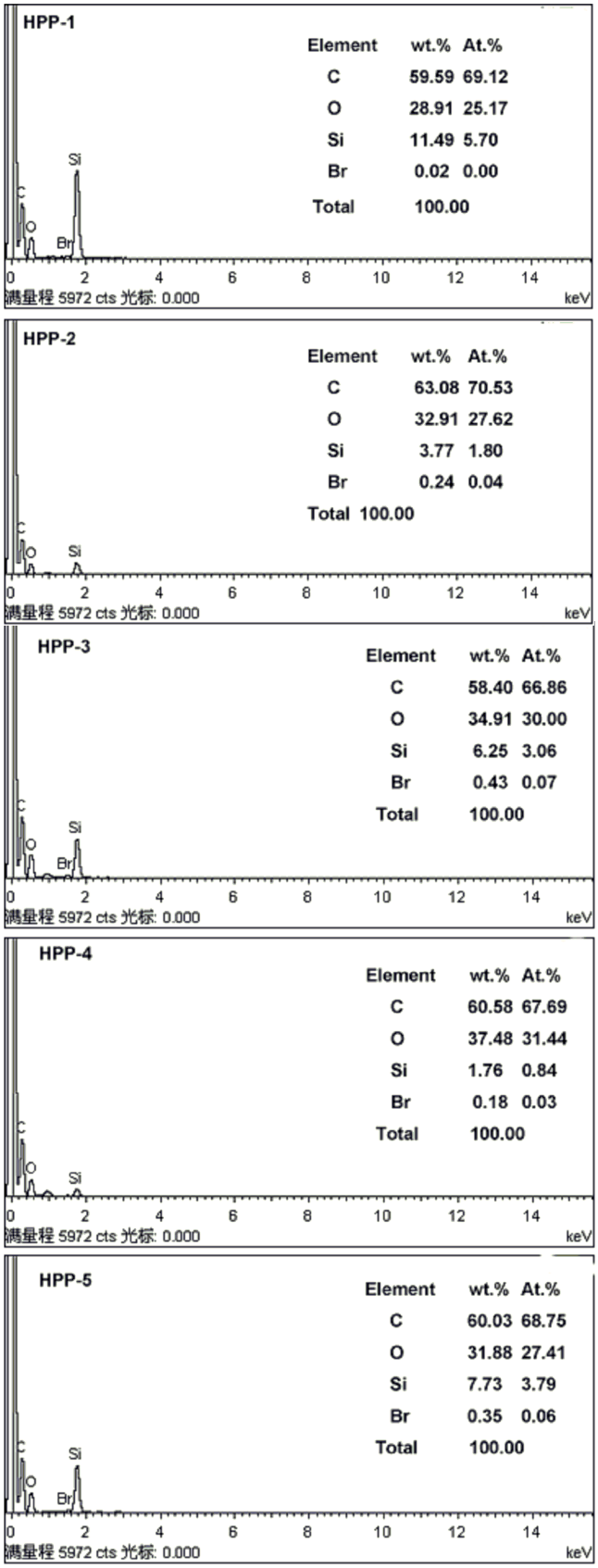

Fig. S1. Energy dispersive spectroscopy of HPP-1 to HPP-5

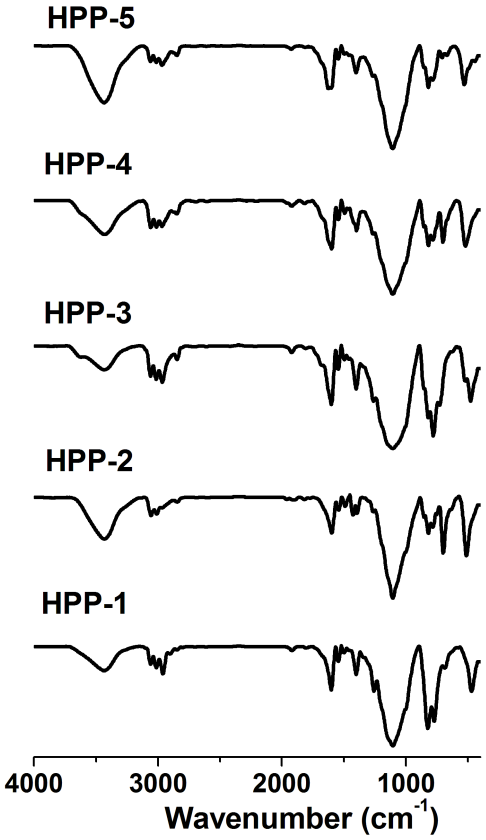

Fig. S2. FT-IR spectrum of HPP-1 to HPP-5

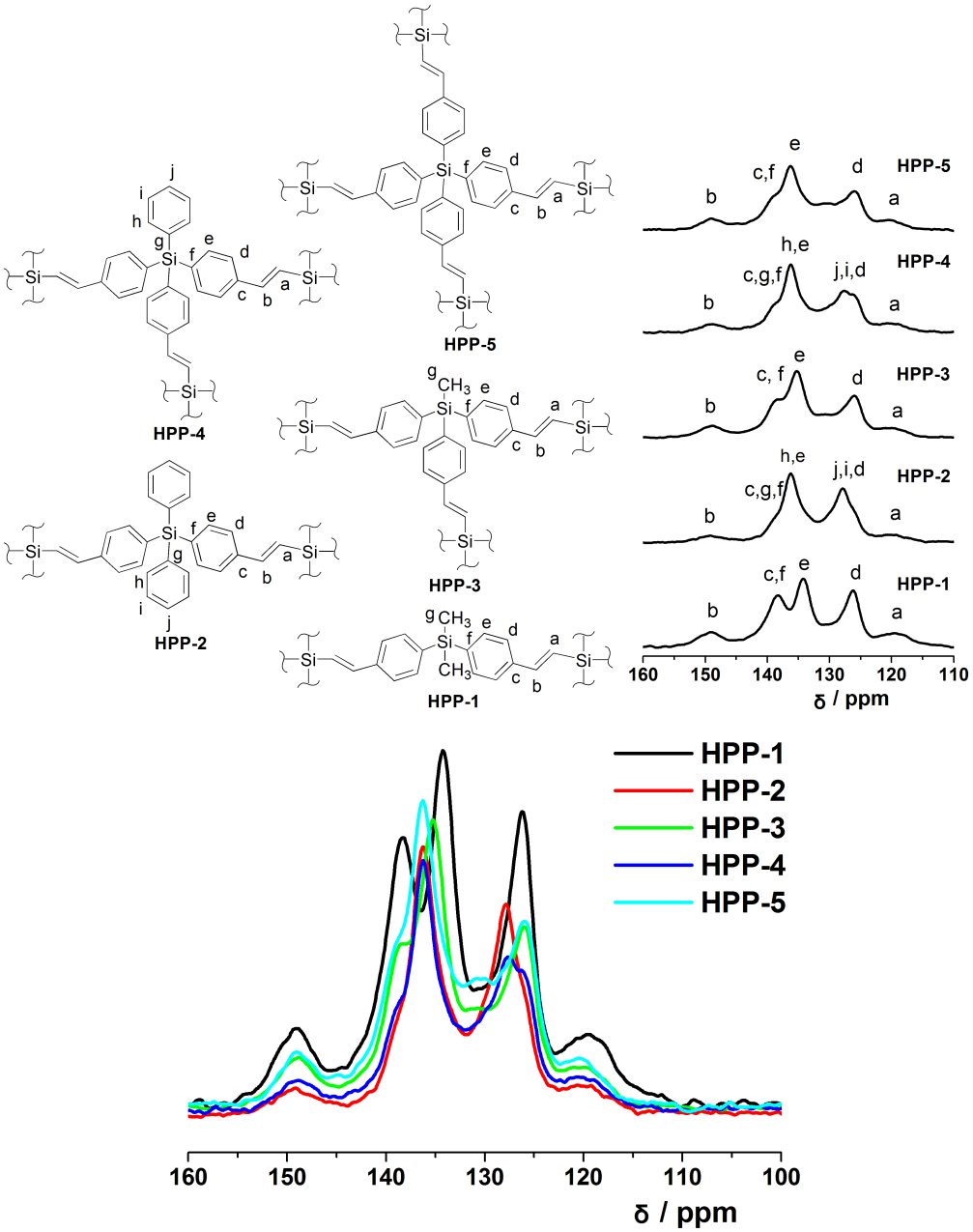

Fig. S3. Solid-state ^{13}C CP/MAS NMR spectra of **HPP-1**~**HPP-5** at a expanded scale from 100 ppm to 160 ppm

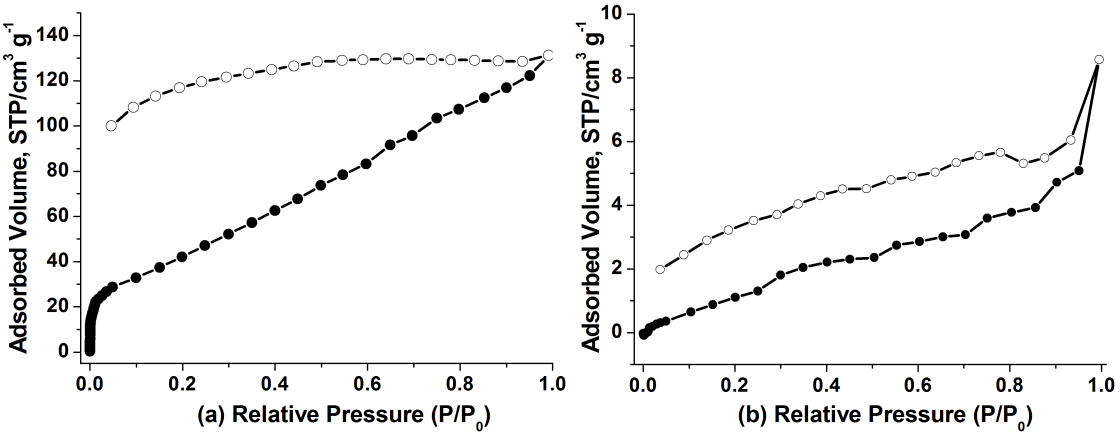

Fig. S4. Nitrogen sorption isotherms of HPP-1 (a) and (b) HPP-2. Filled and empty symbols denote adsorption and desorption braches. The porosity data of HPP-1: $S_{BET} = 167$ m^2 g^{-1}, $V_{total} = 0.18$ cm^3 g^{-1}.

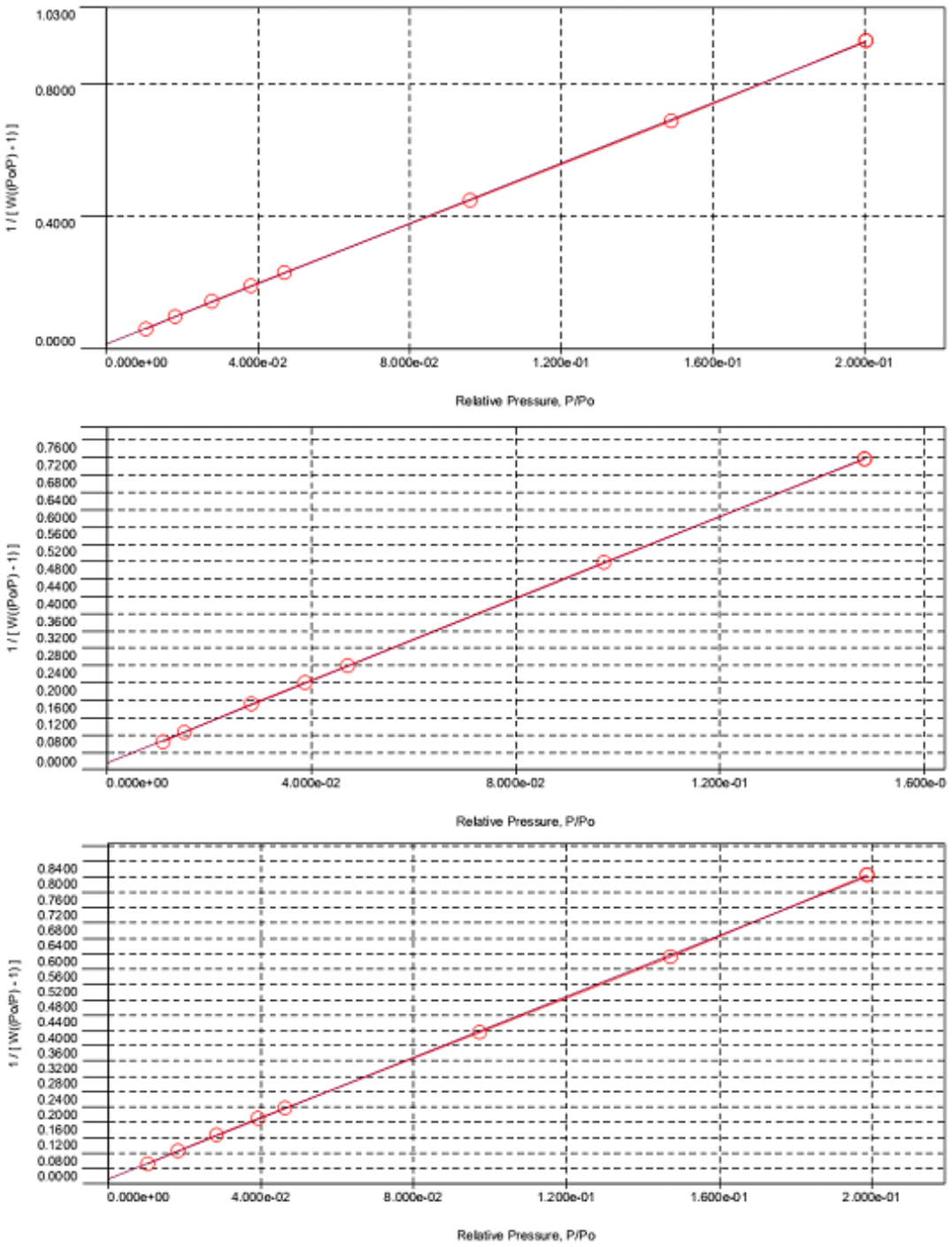

Fig. S5. BET plots of HPP-3 (up, r = 0.999958, C = 290.91), HPP-4 (middle, r = 0.999956, C = 299.075) and HPP-5 (bottom, r = 0.999927, C = 298.54)

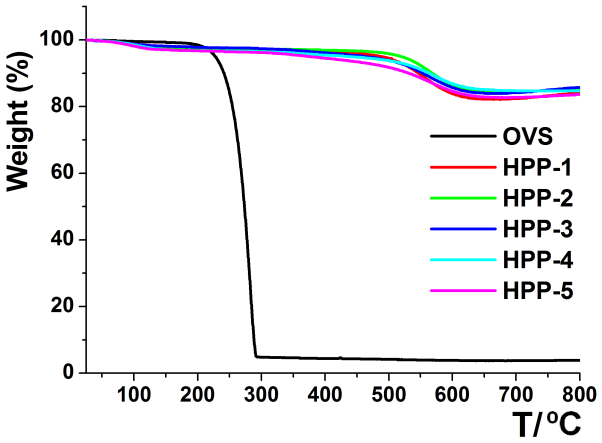

Fig. S6. TGA curves of OVS and HPP-1~HPP-5 under N_2 (10 °C min^{-1})

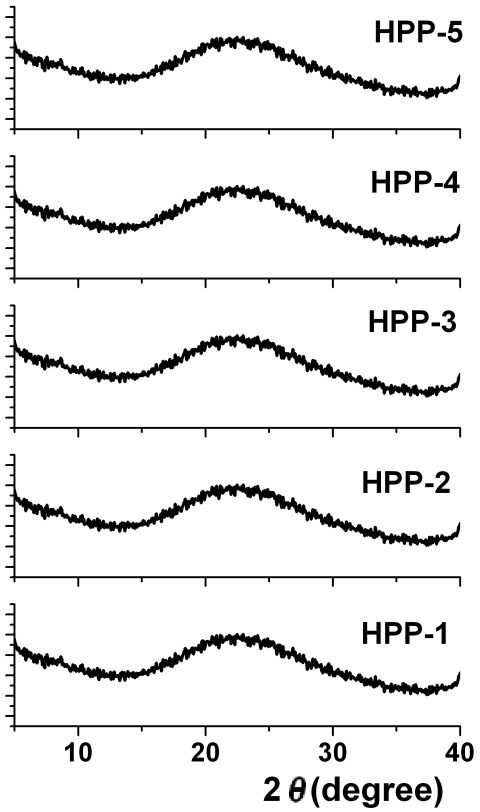

Fig. S7. The XRD pattern of HPP-1 to HPP-5

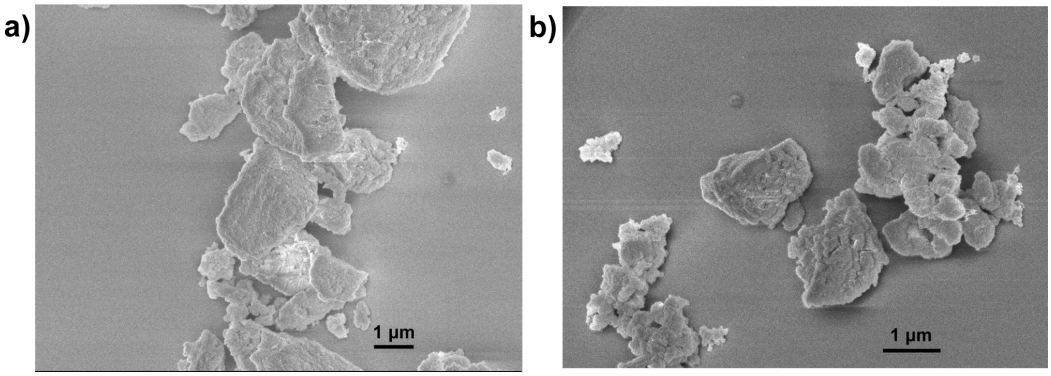

Fig. S8. FE-SEM images of a) HPP-4 and b) HPP-5

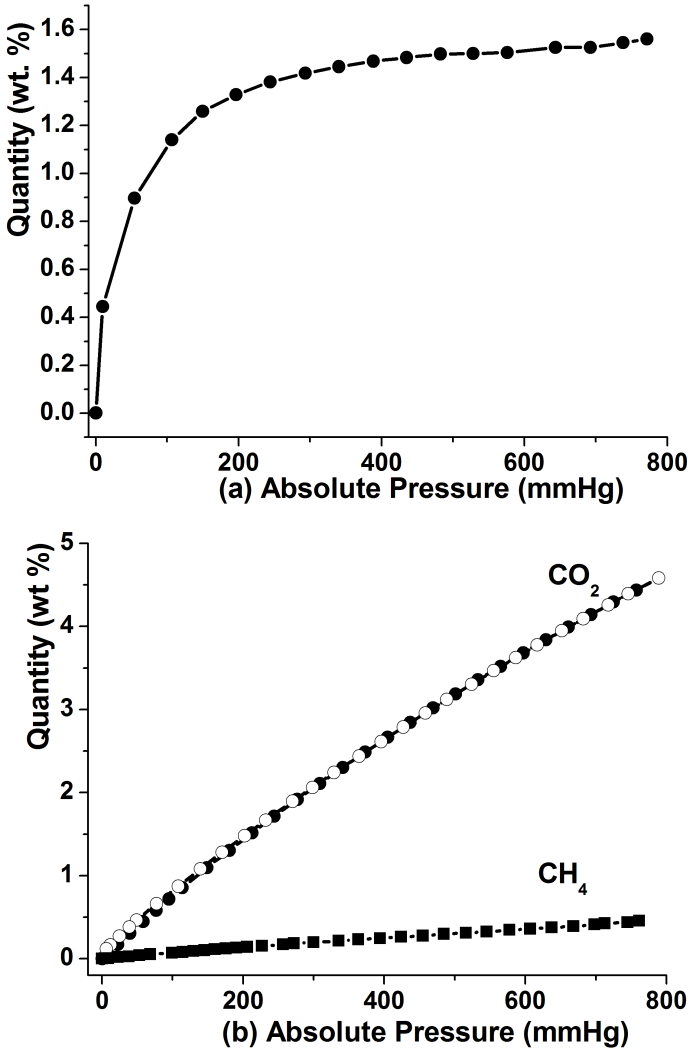

Fig. S9. Gas sorption isotherms of HPP-5. (a) H_2 adsorption isotherm at 77 K. (b) CO_2 adsorption and desorption isotherm, and CH_4 adsorption isotherm at 298 K. Filled and empty symbols denote adsorption and desorption branches, respectively

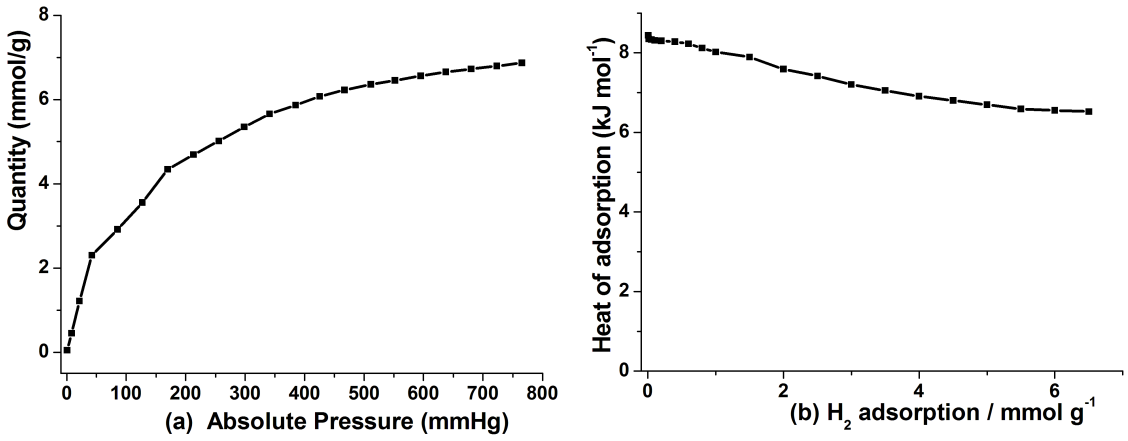

Fig. S10. (a) H_2 adsorption isotherm of HPP-5 at 87 K; (b) Isosteric heats of sorption for H_2 on HPP-5.

Henry's Law selectivity of CO_2 over CH_4 in HPP-5 at 298 K

A nice fitting of CO_2 and CH_4 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:

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

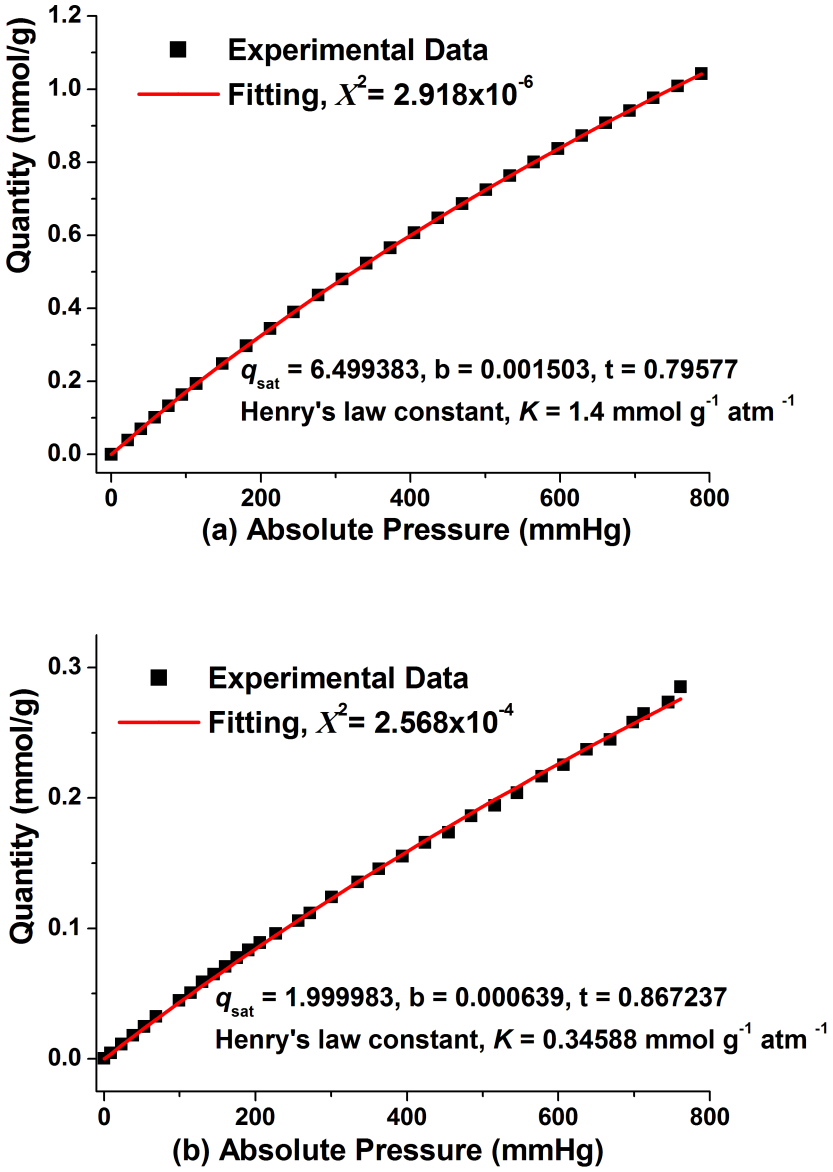

Fig. S11. Toth model fitting of CO_2 (a) and CH_4 (b) adsorption isotherms of HPP-5 at 298 K

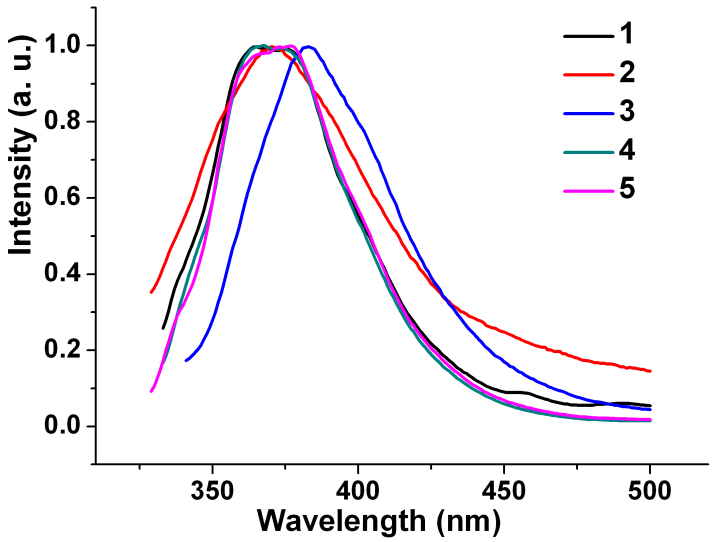

Fig. S12. Fluorescent spectra of monomers, **1**~**5** in the solid state (excited at 310 nm)

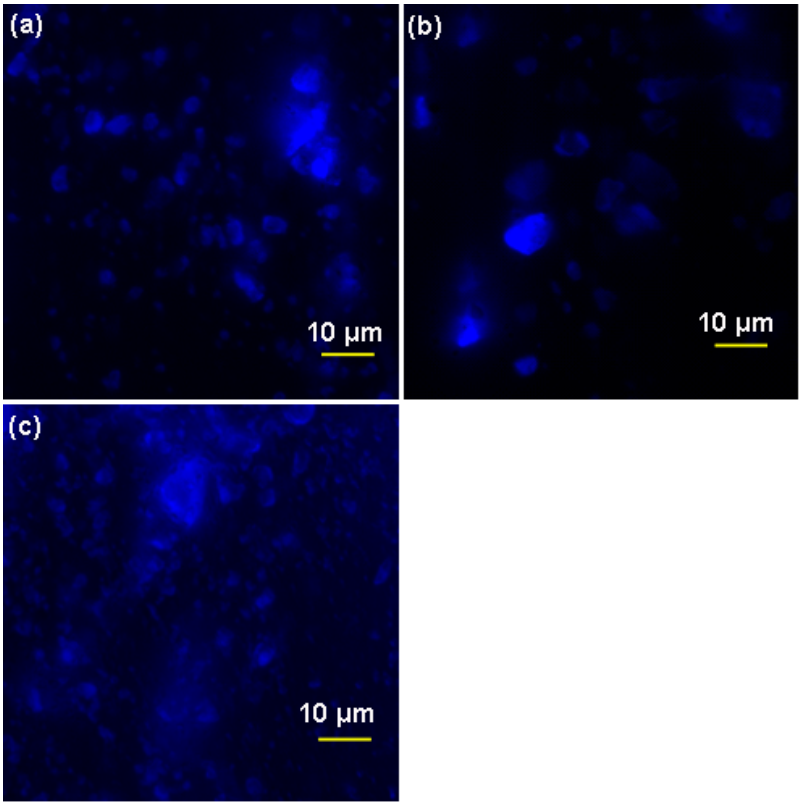

Fig. S13. Fluorescence microscopic images of (a) HPP-1, (b) HPP-2 and (c) HPP-3

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.