Electronic Supplementary Information

In situ knitted microporous polymer membranes for efficient CO_2 capture

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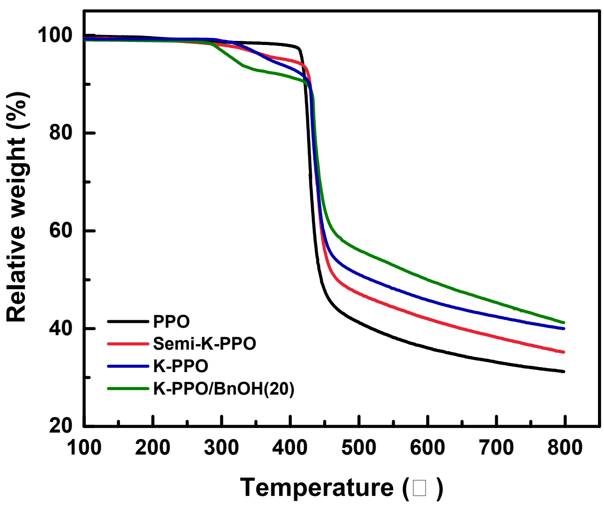

Fig. S1. Thermogravimetric curves for K-PPO and K-PPO/BnOH(20) membranes.

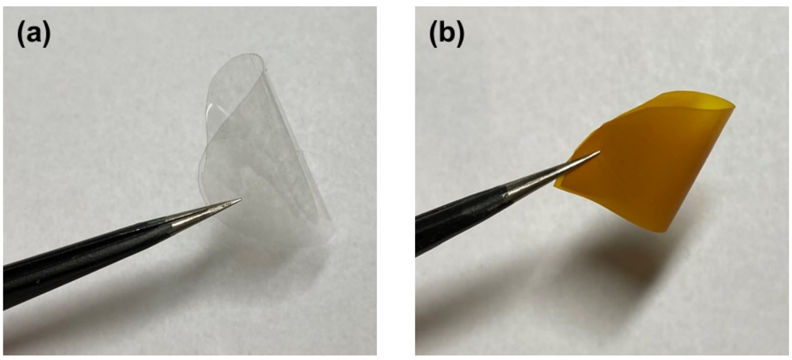

Fig. S2. Optical images of (a) PPO/BnOH composite membrane and (b) K-PPO/BnOH(20) membrane.

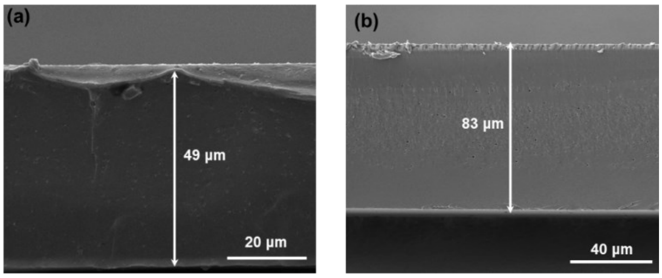

Fig. S3. Cross-sectional SEM images of (a) PPO/BnOH composite membrane and (b) K-PPO/BnOH(20) membrane.

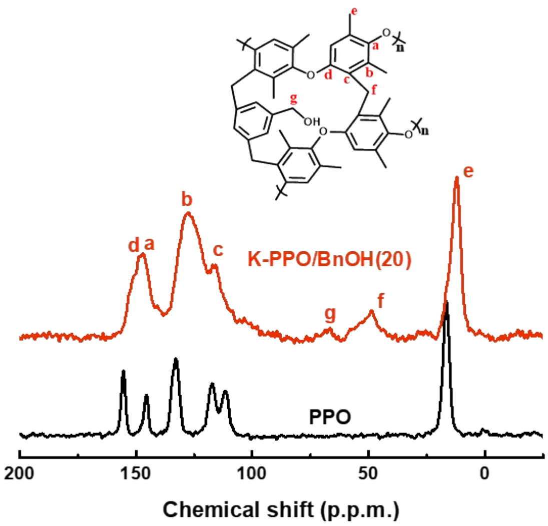

Fig. S4. Solid-state ^{13}C CP/MAS NMR spectra of PPO and K-PPO/BnOH(20) membranes.

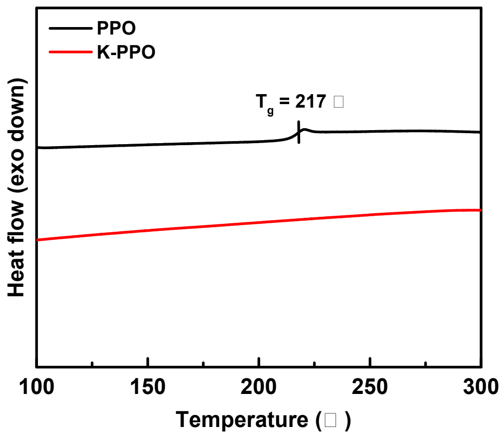

Fig. S5. Thermal DSC analysis of the PPO and K-PPO membranes.

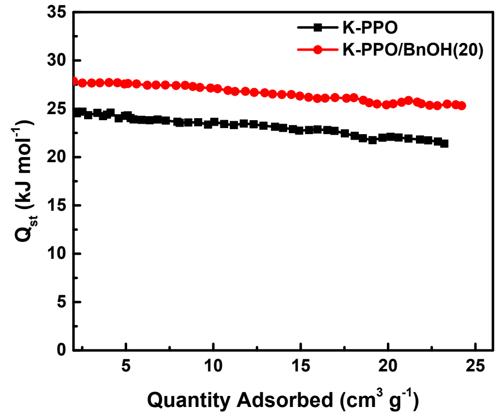

Fig. S6. Isosteric heats of adsorption of CO_2 for K-PPO and K-PPO/BnOH(20) membranes

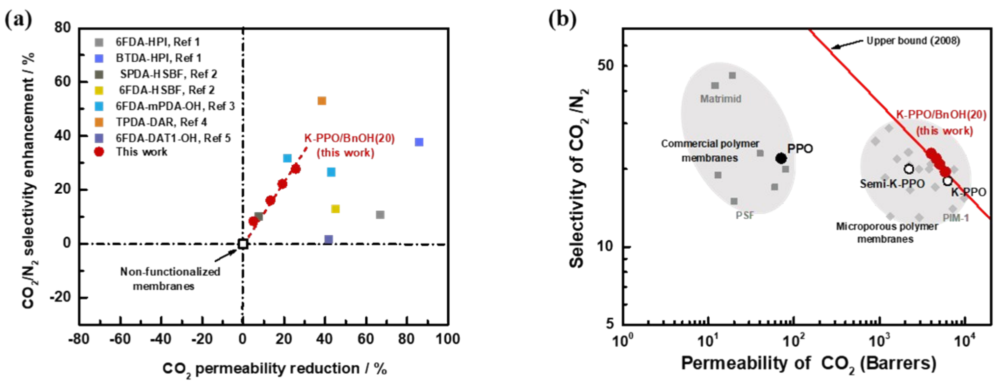

Fig. S7. (a)Comparison of the CO_2/N_2 performances enhancement for hydroxyl-functionalized membranes. The red dashed line is drawn to guide the eye. (b) Comparsion of CO_2/N_2 separation performance between our work and others[1-5] in Robeson plots.

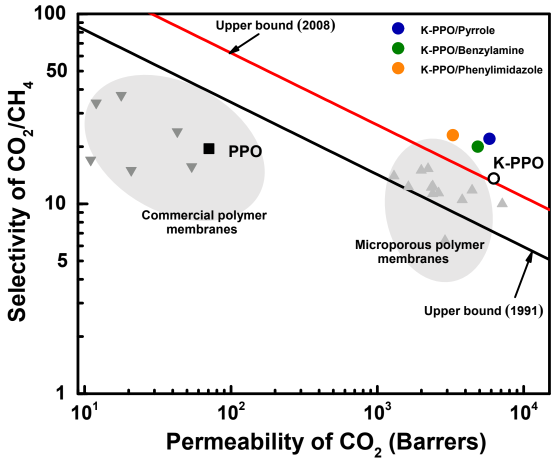

Fig. S8. Exploratory results of gas separation performances of three other knitted microporous polymer membranes using benzylamine, pyrrole, and 1- phenylimidazole building units.

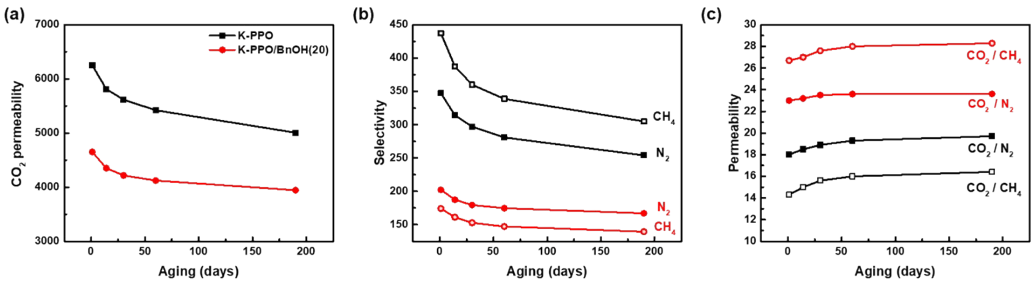

Fig. S9. (a) CO_2 permeability, (b) N_2 and CH_4 permeability, and (c) CO_2/N_2 and CO_2/CH_4 selectivity for K-PPO and K-PPO/BnOH(20) membranes as functions of time.

Table S1 the crosslinking degree in different membranes

Membrane	m_1 (g)	m_2 (g)	Weight gain (wt%)	Crosslinking degree %
Semi-K-PPO	0.7589	0.8146	7.35	126
K-PPO	0.7650	0.8525	11.43	196

According to the previous reports[6], we calculate the molar ratio of -CH_2- bridge to PPO unit by the weight gain after crosslinking reaction. Pristine membranes were weighed before crosslinking reaction to determine weight (m_1). After reaction, membranes were reweighed (m_2). The membrane weight was measured by an electronic balance (OHAUS, CP224C). Each membrane was tested for three times and the average value was adopted. The weight gain (wt%) was calculated based on the following equations:

$$\text{weight gain} = (m_2 - m_1) / m_1 \times 100\% \tag{S1}$$

The crosslinking degree was calculated by:

$$\text{Crosslinking degree} = 2N_c/N_p \tag{S2}$$

where N_c refers the amount of crosslinking bridge. N_p is the amount of repeat polymer units.

References

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