Electronic Supplementary Material (ESI) for RSC Advances.

Enhanced water retention and proton conductivity of the proton exchange membranes by incorporating hollow polymer microspheres grafted with sulfonated polystyrene brushes

Wei Zhang[a,c], Bei Zhang[a,c], Guangwei He,[b,c] Bin Liu,[a,c] Zhongyi Jiang, [b ,c] Xinlin Yang, [a,c, *] and Chenxi Li[a]

a) Key Laboratory of Functional Polymer Materials, the Ministry of Education, Institute of Polymer Chemistry, Nankai University, Tianjin 300071, P. R. China

b) Key Laboratory for Green Chemical Technology of Ministry of Education, School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072 China.

c) Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin 300072 China

[*] Corresponding author: Tel: +86-22-23502023, Fax: +86-22-23503510, E-mail: xlyang88@nankai.edu.cn

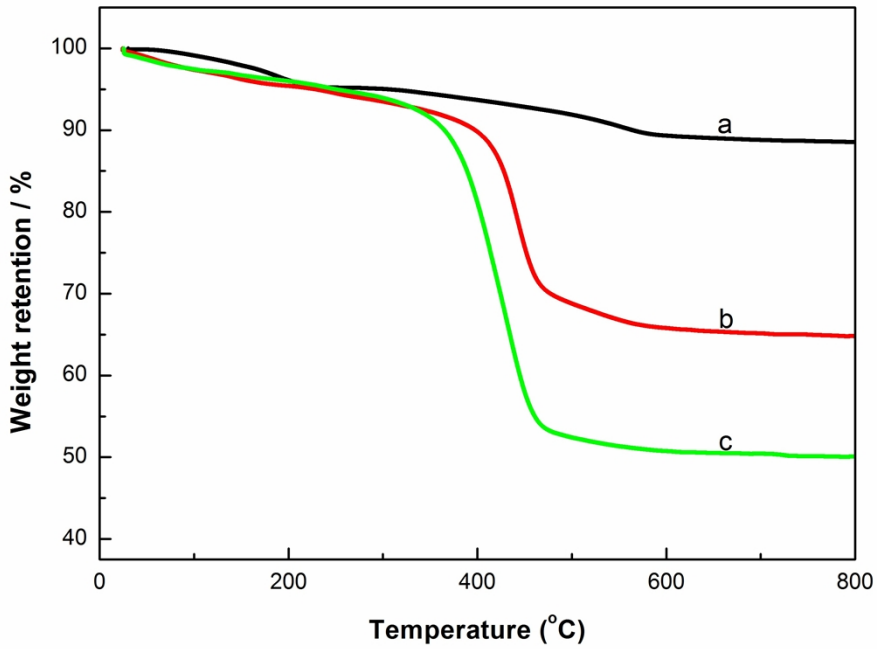
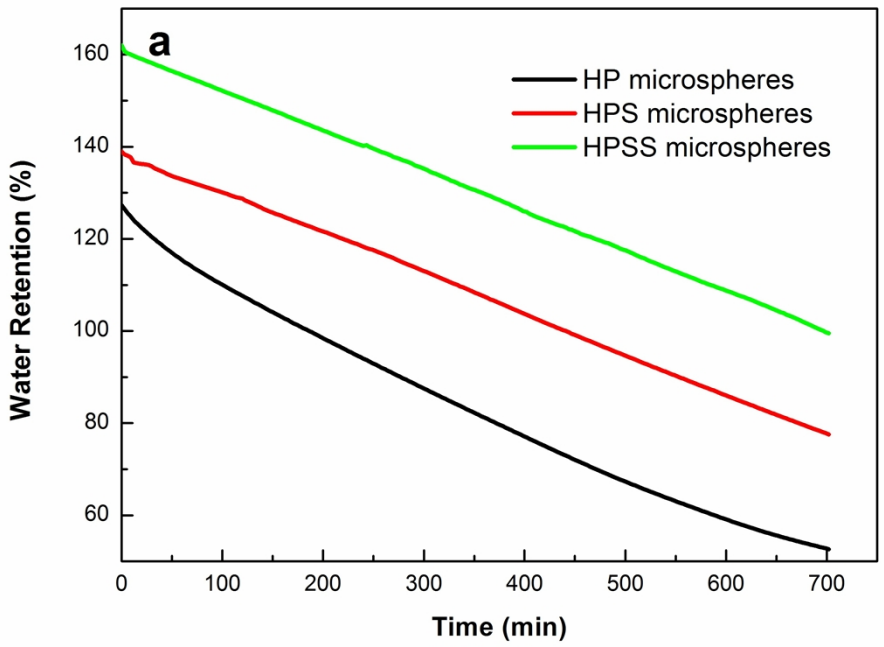


Figure S1 TGA curves: a) SiO_2-MPS microspheres; b) SiO_2@P(MAA-*co*-DVB-*co*-CMSt) core-shell microspheres; and c) SiO_2@P(MAA-*co*-DVB-*co*-CMSt)-*g*-PSt microspheres.



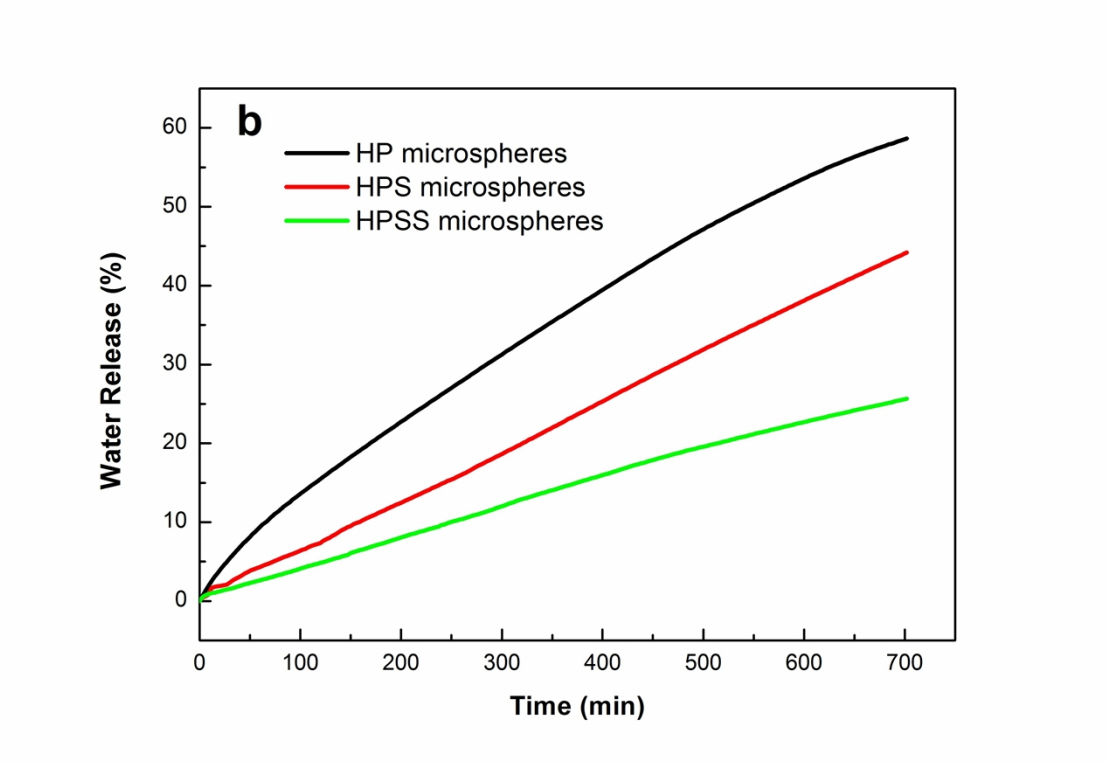
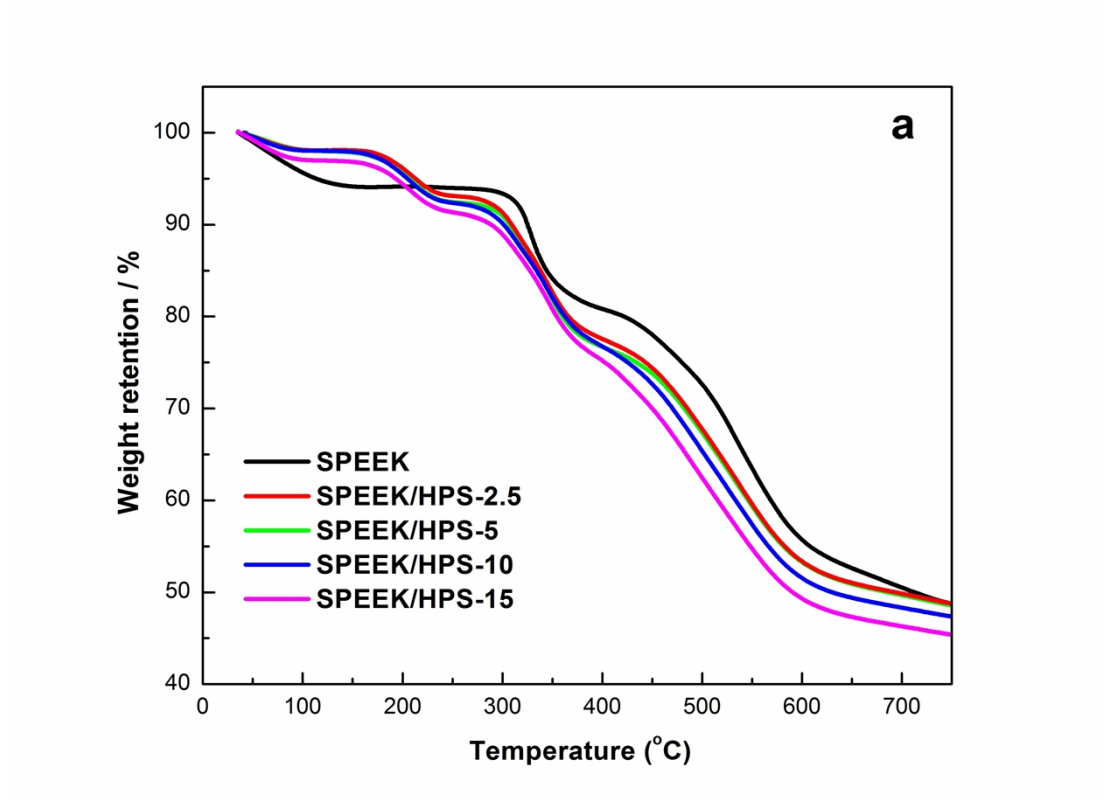


Figure S2 Water preservation of the hollow microspheres: a) water retention; and b) water release. All these data were determined at 40 °C and 20 % RH.



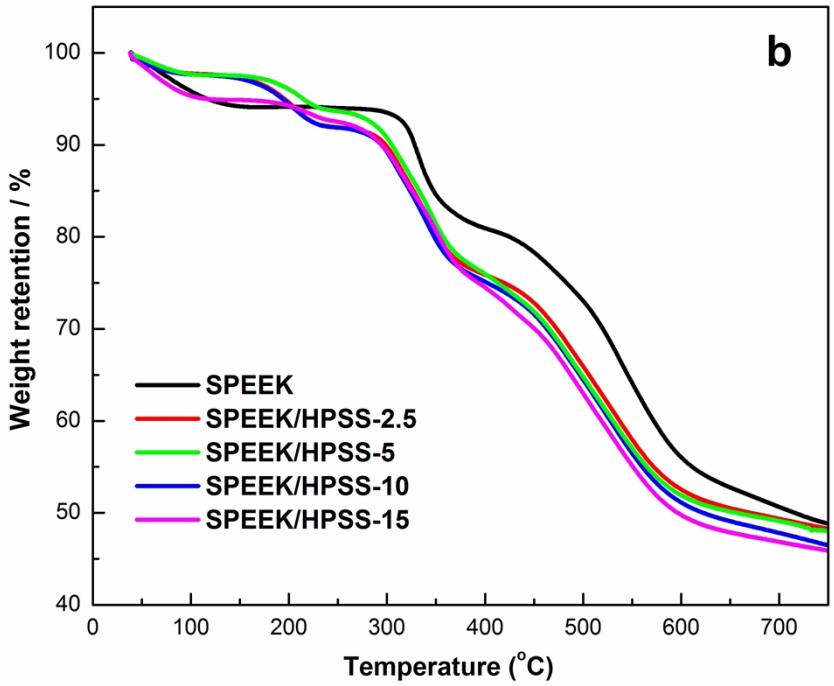


Figure S3 TGA curves of the pristine SPEEK, SPEEK/HPS: a) and SPEEK/HPSS; b) hybrid membranes.

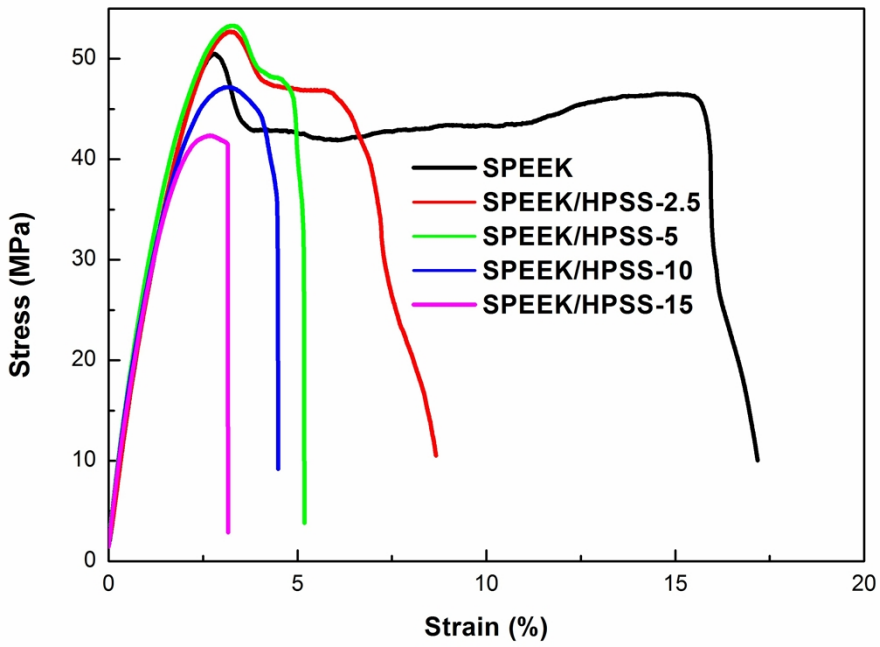


Figure S4. Stress-strain curves of the pristine SPEEK and SPEEK/HPSS hybrid membranes.

Table S1 Glass transition temperature (T_g) of the pristine SPEEK and hybrid membranes

Membrane	Transition temperature (℃)	
SPEEK		216
SPEEK/HPS-2.5	134	178
SPEEK/HPS-5	137	180
SPEEK/HPS-10	138	183
SPEEK/HPS-15	139	184
SPEEK/HPSS-2.5	133	182
SPEEK/HPSS-5	137	185
SPEEK/HPSS-10	144	187
SPEEK/HPSS-15	145	190