

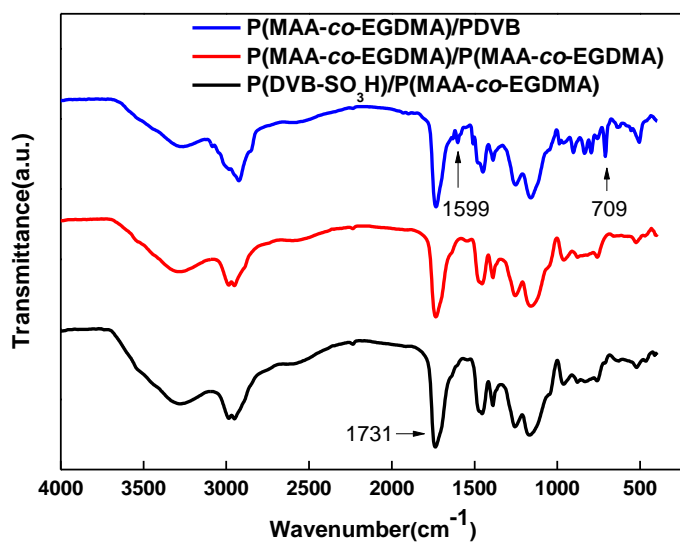
Enhanced Water Retention and Stable Dynamic Water Behaviour of Sulfonated Poly(ether ether ketone) Membranes (SPEEK) under Low Humidity by Incorporating Humidity Responsive Double-shelled Hollow Spheres

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Zhongyi Jiang^{b)}, Xinlin Yang^{a)*} and Xu Zhang^{a)}

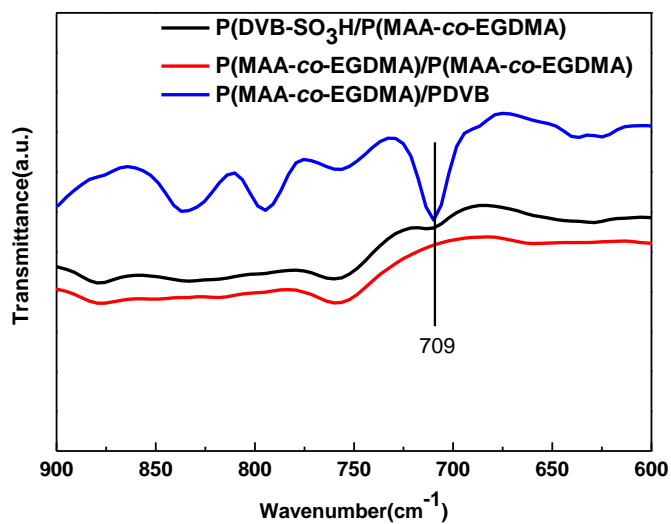
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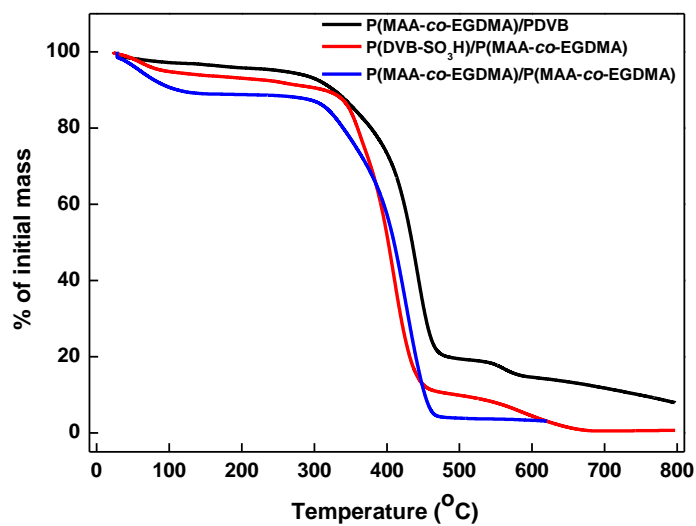
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(A)



(B)



(C)

Fig. S1 Fig. 2 FT-IR of DSHSs (A,B) and TGA curves of DSHSs

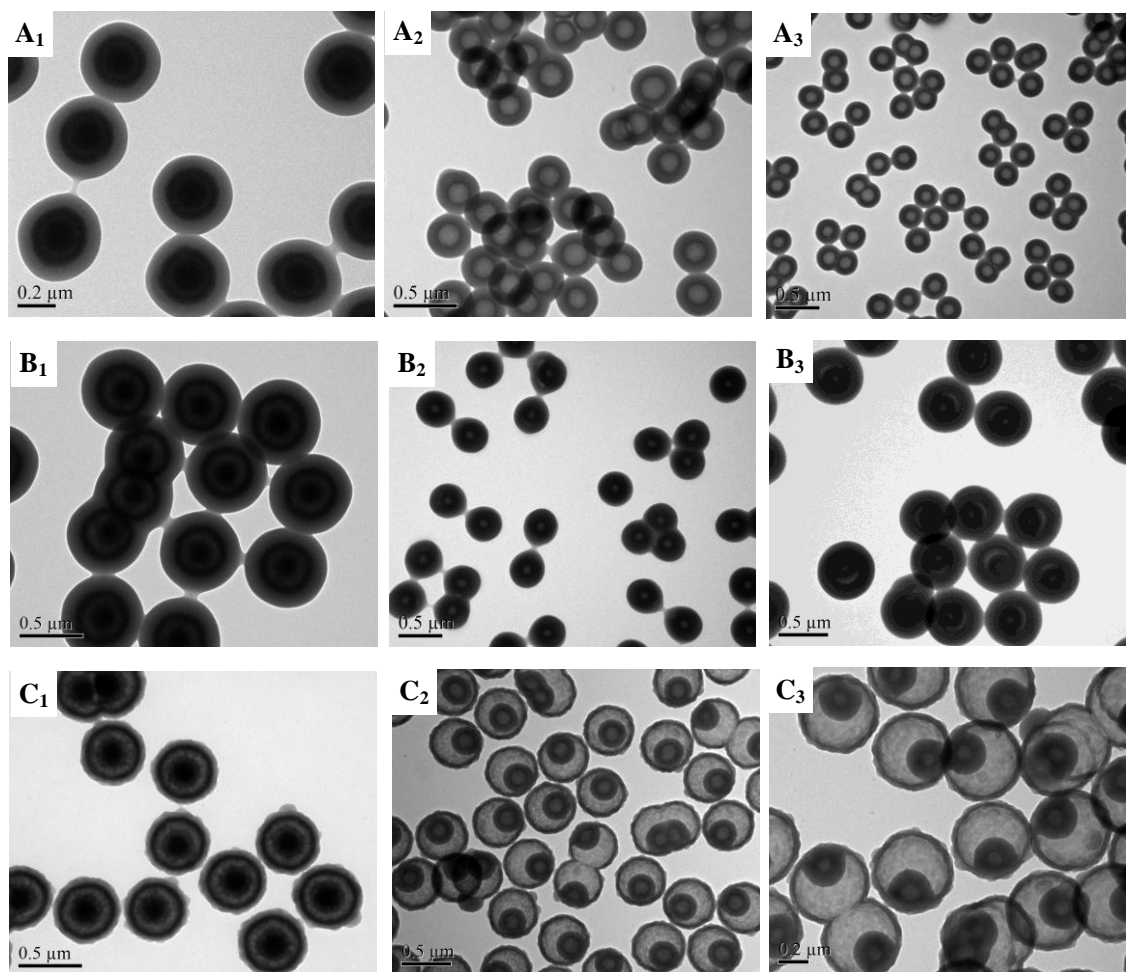


Fig. S2 TEM graphs of spheres: A₁: SiO₂/P(DVB-SO₃H)/SiO₂/P(MAA-*co*-EGDMA) tetra-layer spheres; A₂, A₃: P(DVB-SO₃H)/P(MAA-*co*-EGDMA) DSHSs; B₁: SiO₂/P(MAA-*co*-EGDMA)/SiO₂/P(MAA-*co*-EGDMA) tetra-layer spheres; B₂, B₃: P(MAA-*co*-EGDMA)/P(MAA-*co*-EGDMA) DSHSs; C₁: SiO₂/P(MAA-*co*-EGDMA)/SiO₂/PDVB tetra-layer spheres; C₂, C₃: P(MAA-*co*-EGDMA)/PDVB DSHSs.

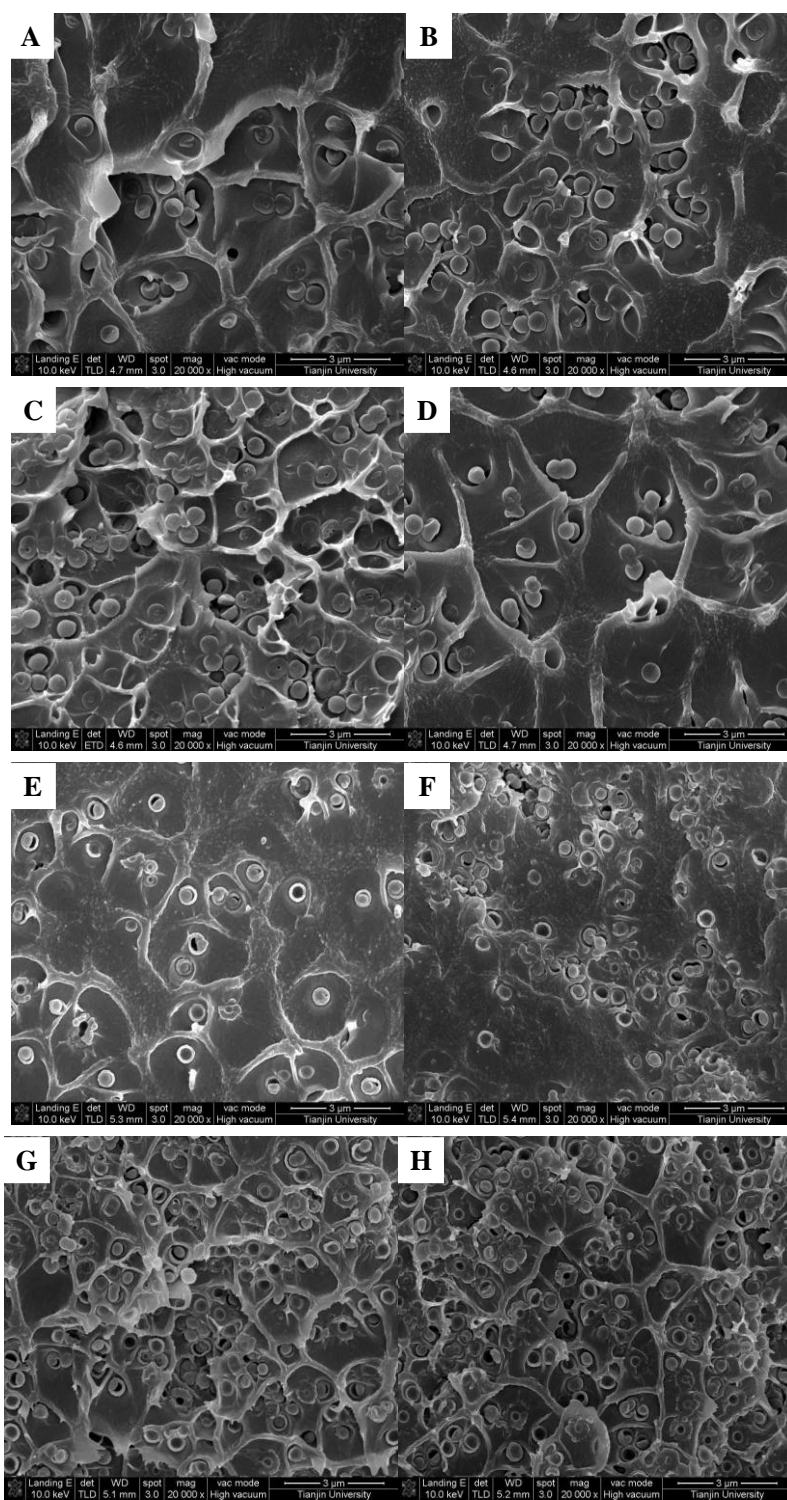
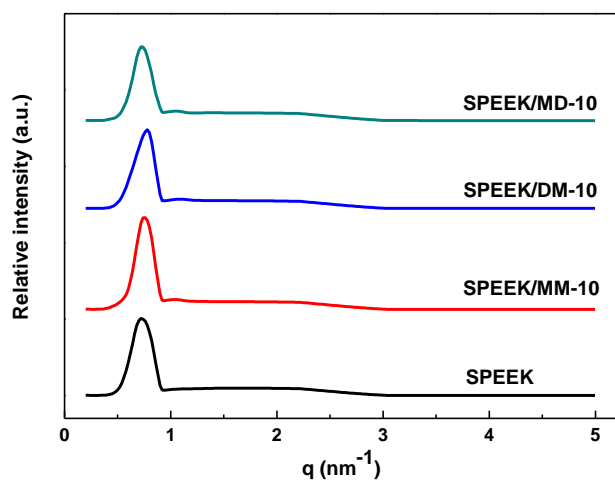
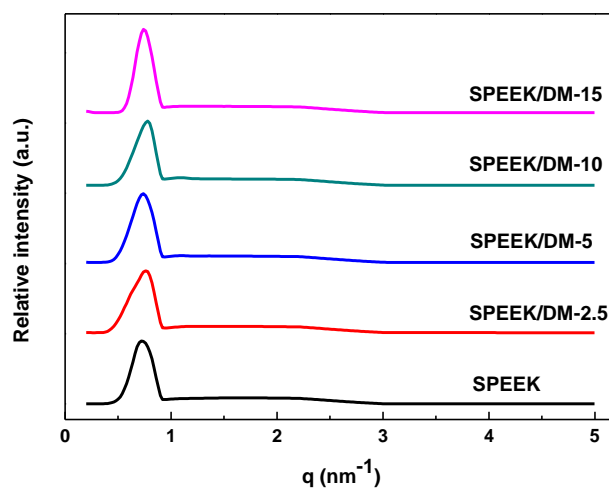


Fig. S3 FESEM of hybrid membranes

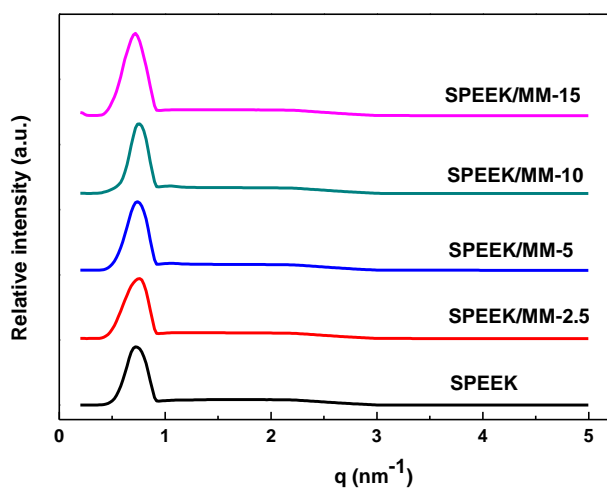
A: SPEEK/MM-2.5, B: SPEEK/MM-5, C: SPEEK/MM-10, D: SPEEK/MM-15
E: SPEEK/MD-2.5, F: SPEEK/MD-5, G: SPEEK/MD-10, H: SPEEK/MD-15



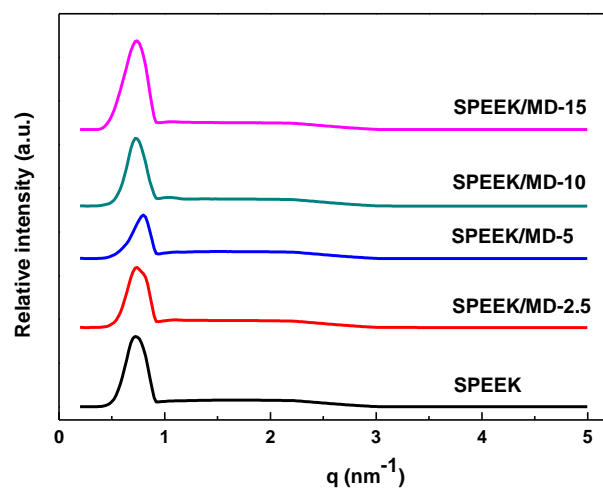
(A)



(B)

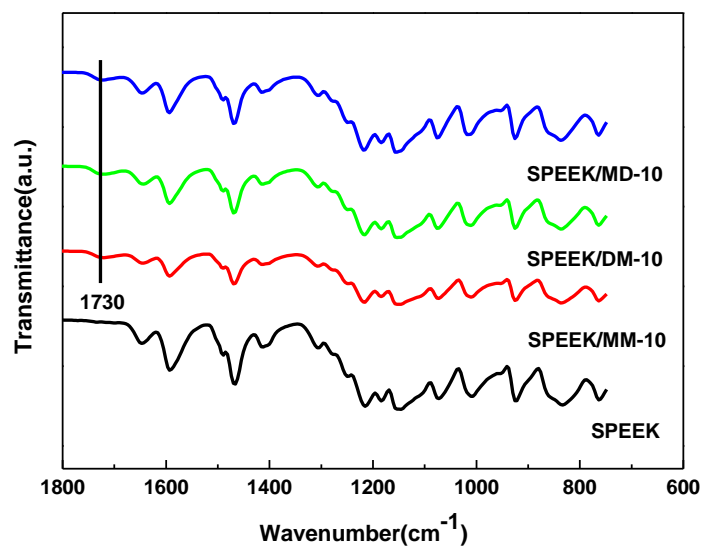


(C)

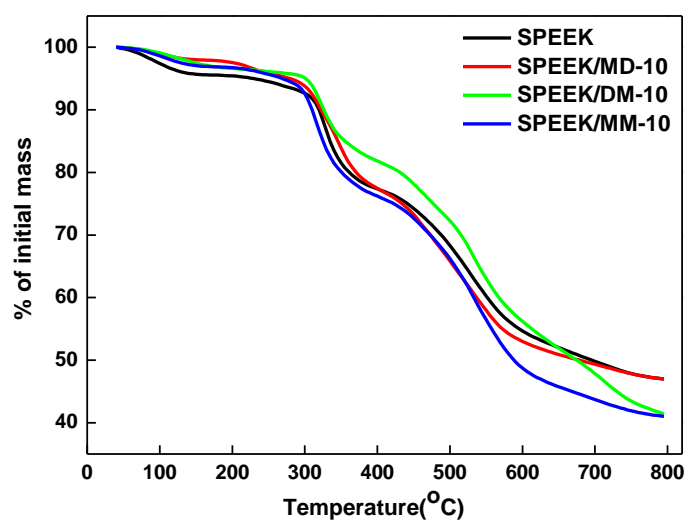


(D)

Fig. S4 SAXS curves of hybrid membranes (A), SPEEK/DM membranes (B),
SPEEK/MM membranes (C), SPEEK/MD membranes (D)



(A)



(B)

Fig. S5 FT-IR (A) and TGA (B) curves of membranes

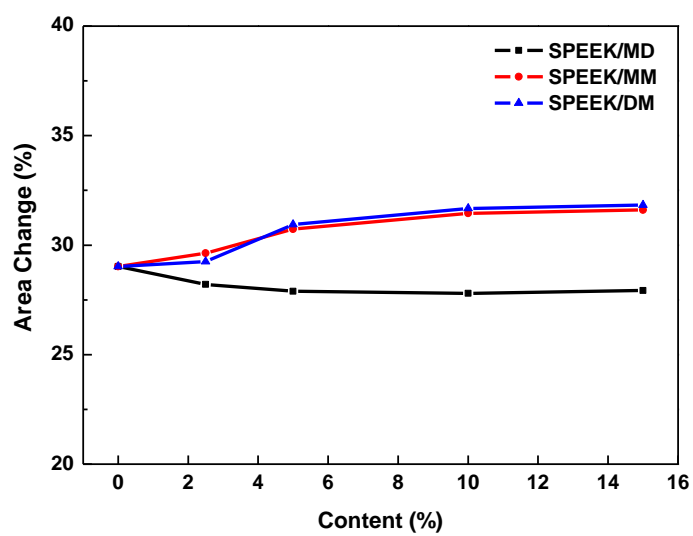


Fig. S6 Dimension change of membranes as the function of DSHSs content