Supporting information

Influence of nitrogen/phosphorus-doped carbon dots on polyamide thin film membranes for water vapor/N_2 mixture gas separation

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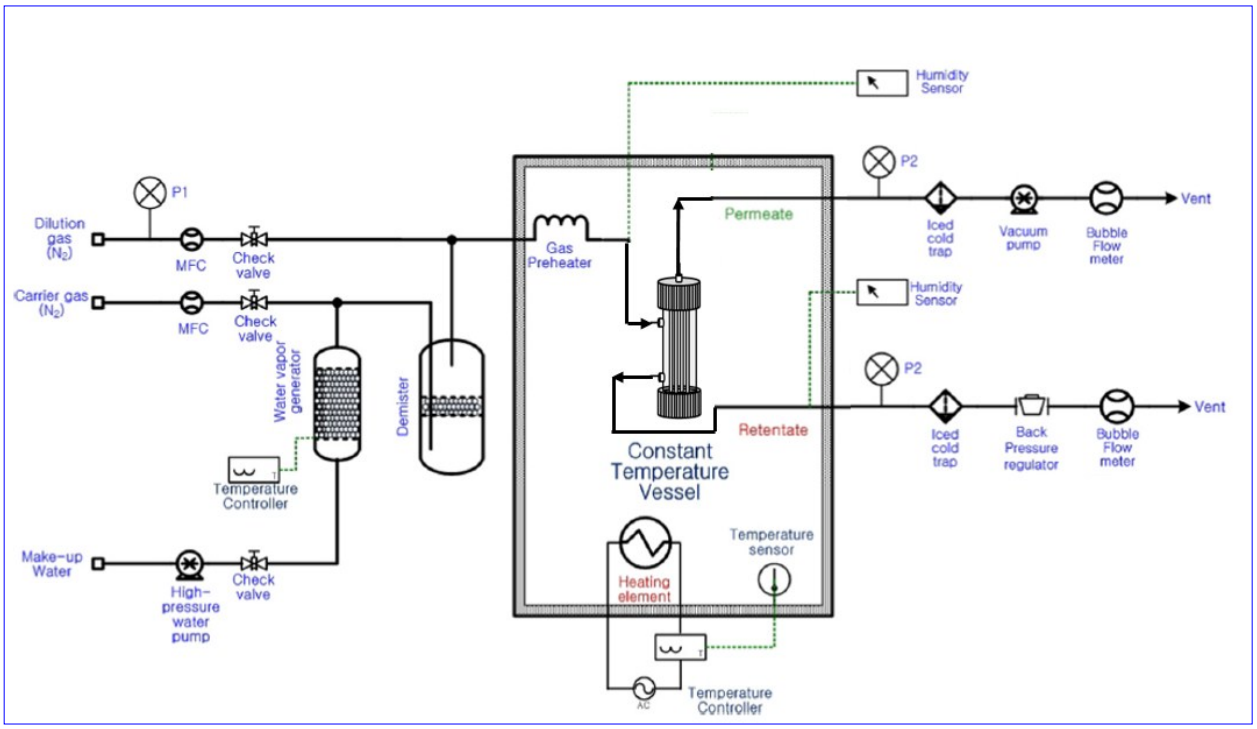

Figure S1: Lab scale instrumental design for the water vapor/N_2 mixture gas separation (Ref: 19)

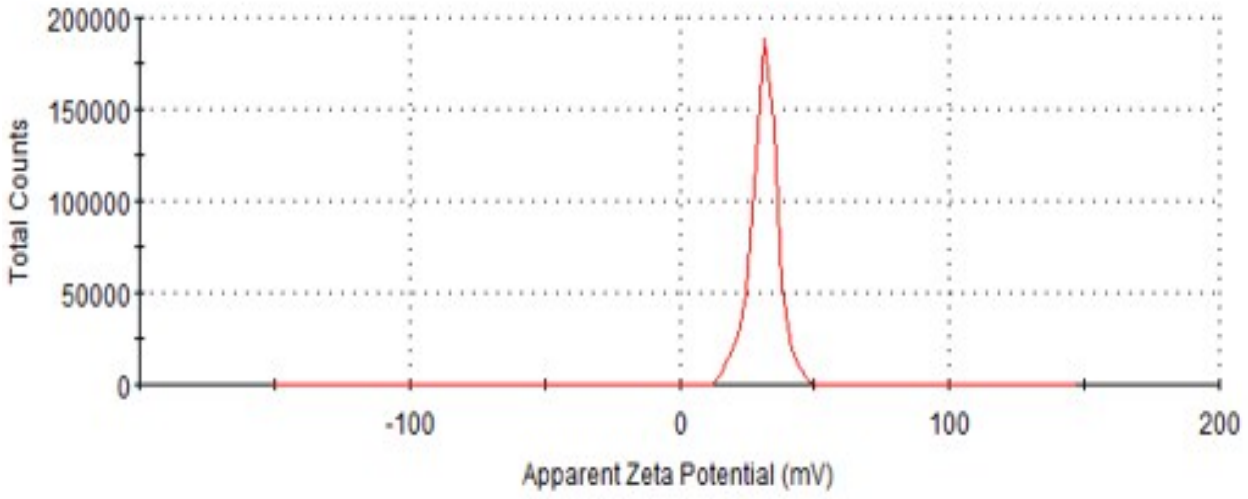

Figure S2. The zeta potential of the as synthesized NP-CDs**.**

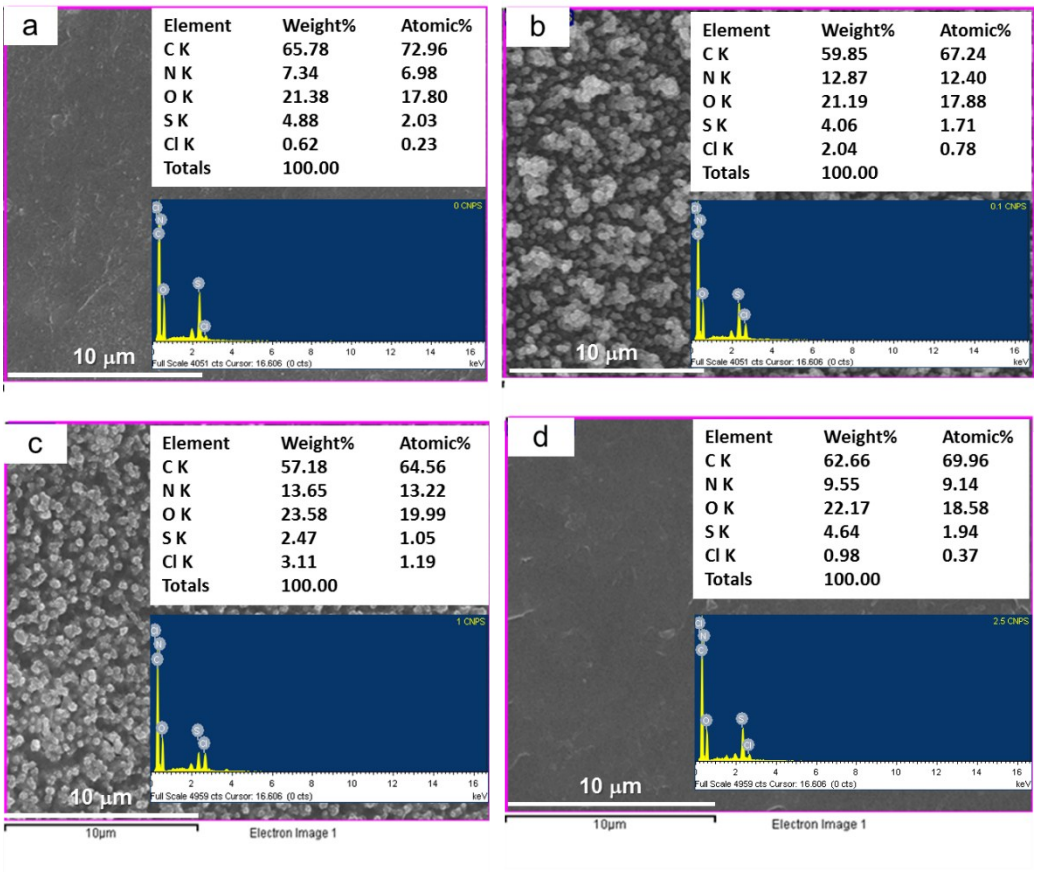

Figure S3. EDX analysis of TFC and TFN membranes: a) DT-TFC, b) CD-TFN(0.1), c) CD-TFN(1), d) CD-TFN(1.5).

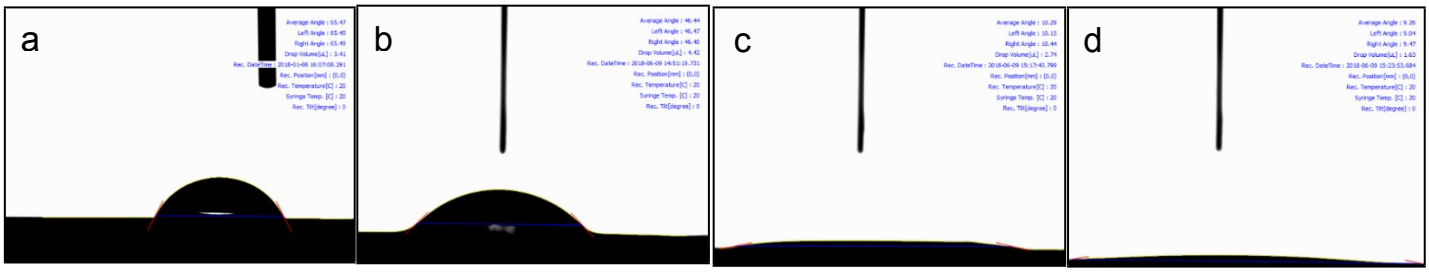

Figure S4. The surface hydrophilicity of the Psf substrate, TFC and TFN membranes prepared by embedding N, P-CDs nanoparticles in the aqueous solution with different contents with loading.

Membrane code	Contact angle (°)
PSf (a)	65 ± 2
DT-TFC (b)	46 ± 3
DT-TFN(0.1) (c)	10 ± 2
DT-TFN(0.2) (d)	8 ± 2

Table S1. Comparison of water vapor permeation with state-of-the-art composite polymeric membranes.

Membrane	Type of membrane	Operating temperature (°C)	Operating pressure	Feed humidity	Feed flow rate (cm^3/min)	Ref.
PSf/DABA-TMC-CTiO_2	Hollow fiber	30	3 kg_f/cm^2	AH = 25~27 g/m^3	1000	17
PSf/PDA-DABA-TMC	Hollow fiber	30	3 kg_f/cm^2	RH = 70%	-	13
PSf/MPD-TMC–OH-TiO_2	Hollow fiber	30	3 kg_f/cm^2	RH = 15~80%	1000	19
BTESO-Me-SiO_2	Flat sheet	40	Atmospheric pressure	RH = 0~90%	500	48
PSf/MPD-TMC-Si NPs	Hollow fiber	30	3 kg_f/cm^2	RH = 80%	1000	18
PES/PDA-TFC	Hollow fiber	30	3 kg_f/cm^2	AH = 30~32 g/m^3	1000	12
PSf/ DETA-TMC-βCD-Fe_3O_4	Hollow fiber	30	3 kg_f/cm^2	RH = 20~85%	1000	50
PSf/ DETA-TMC-NP-CDs	Hollow fiber	30	3 kg_f/cm^2	RH = 20~85%	1000	This work