

## Supplementary Information

# The Impact of MOF Feasibility to Improve the Desalination Performance and Antifouling Properties of FO Membranes

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## MOF characterization

In our previous study, Cu-BTC MOF structure was optimized by considering of the temperature and solvent content effects on crystallinity, textural properties and hydrogen storage capacity <sup>1</sup>. So, the optimum structure was chosen to develop FO membranes. Fig S1 shows XRD patterns of the optimum Cu-BTC MOF. Fig S2 exhibits type I of nitrogen adsorption/desorption isotherm at 77 K according to IUPAC classification which indicates microporous structure of the MOF. Fig S3 indicates the morphology, particle shape and porous surface of the Cu-BTC MOF. The textural properties including BET surface area, pore volume, micro pore volume and mean pore diameter was reported in Table S1.

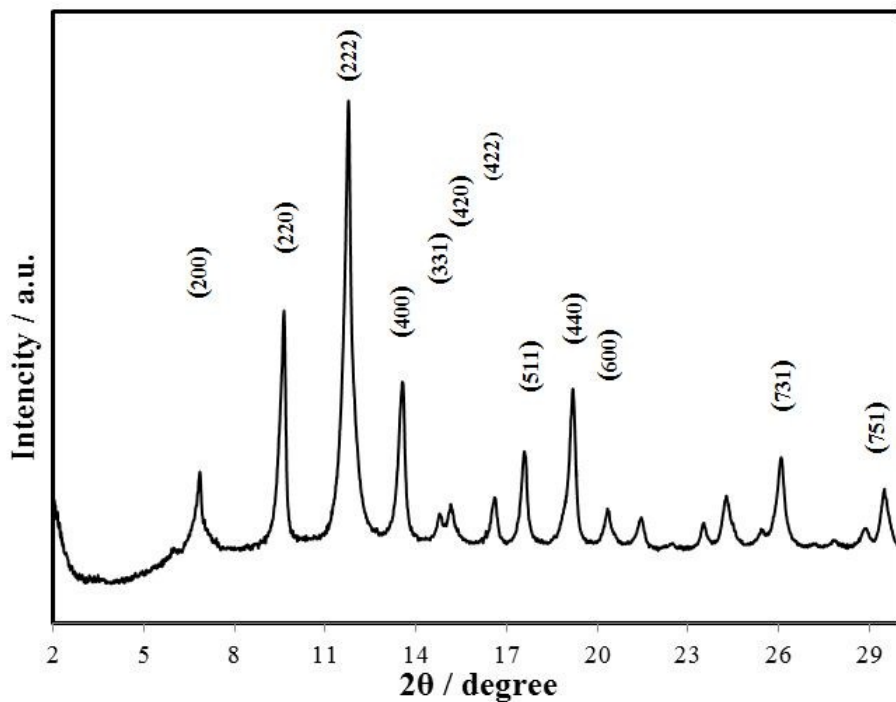


Fig. S1. XRD patterns of Cu-BTC MOF crystals <sup>1</sup>.

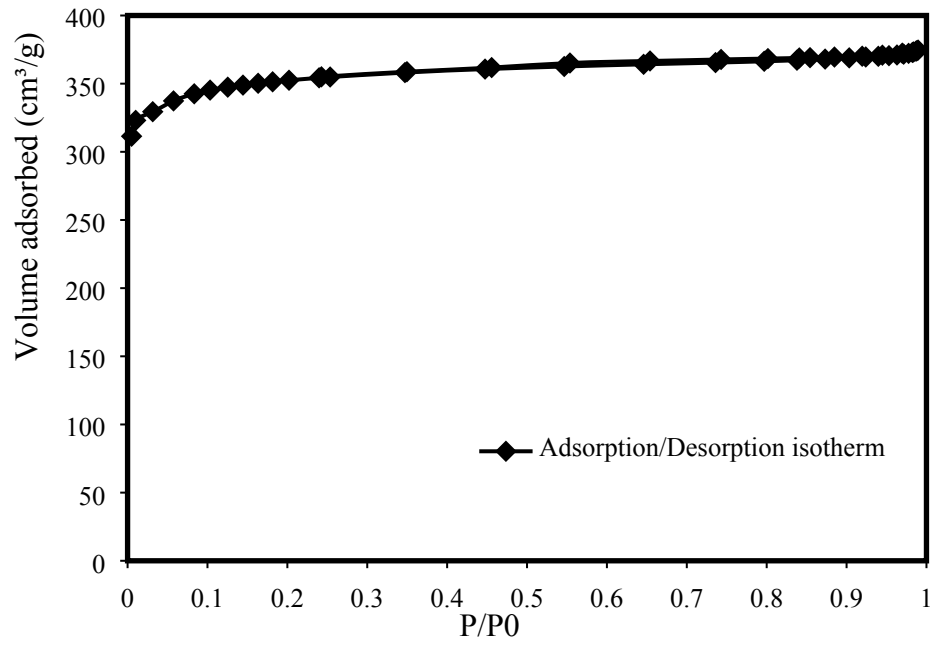


Fig. S2. Nitrogen (N<sub>2</sub>) adsorption/desorption isotherms for Cu-BTC MOF at 77 K <sup>1</sup>.

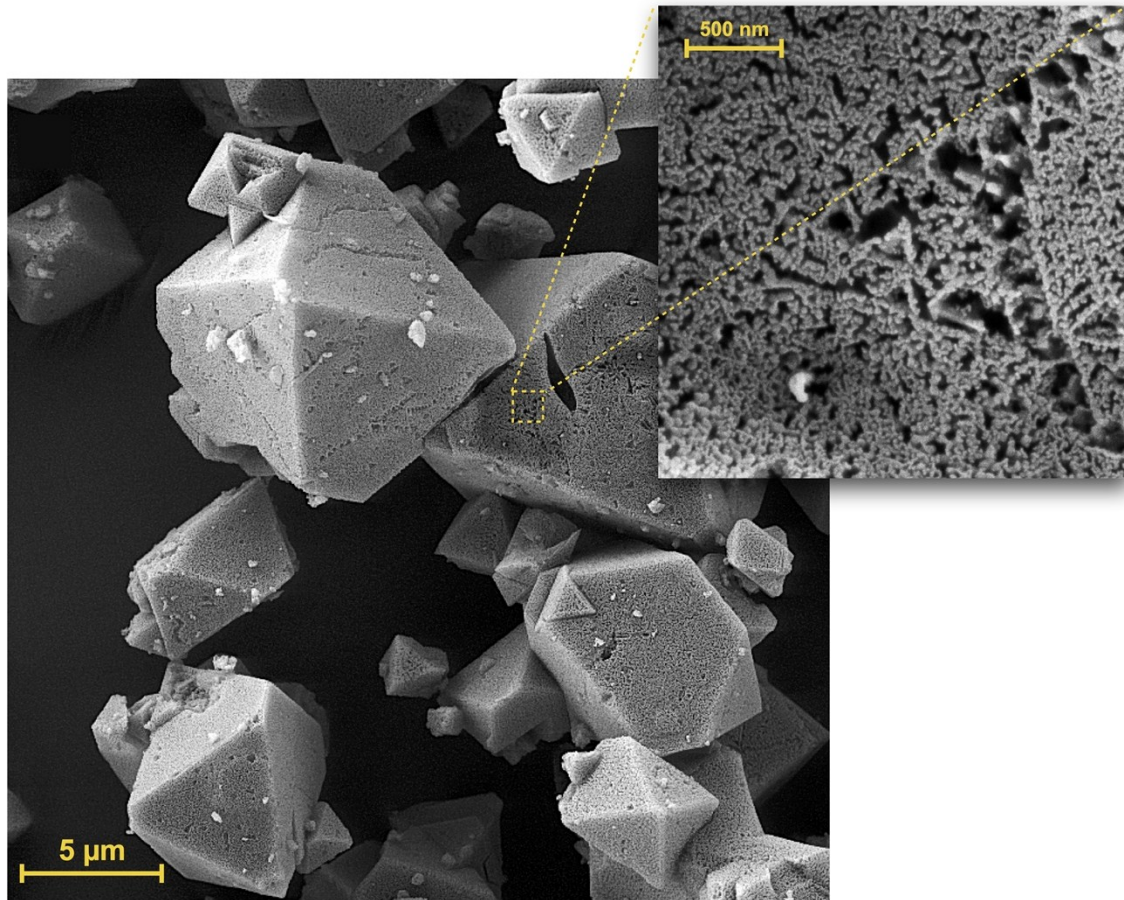


Fig. S3. FE-SEM images of the Cu-BTC MOF crystals applied to develop FO membrane <sup>1</sup>.

Table S1. The textural properties of the synthesized Cu-BTC MOF crystals <sup>1</sup>.

Sample	BET(m <sup>2</sup> /g)	Pore vol. (cm <sup>3</sup> /g) at P/P <sub>0</sub> =0.50	Micro pore volume (cm <sup>3</sup> /g)	Mean pore diameter (nm)
Cu-BTC	1386.9	0.560	0.475	1.67

**Table S2.** The Caspian seawater characterization

Property	Count
Electrical Conductivity	25.0 (dS/m)
Soil pH	7.1
Sodium (Na <sup>+</sup> )	152 (mmoles/l)
Calcium (Ca <sup>+</sup> )	67 (mmoles/l)
Magnesium (Mg <sup>+</sup> )	20 (mmoles/l)
Cl	169 (mmoles/l)
HCO <sub>3</sub>	3.9 (mmoles/l)
SO <sub>4</sub>	64 (mmoles/l)

**Table S3.** Comparison of the structural properties of various FO membranes existing in Fig. 10.

Membrane	A (L/m <sup>2</sup> .h.bar)	B (L/m <sup>2</sup> .h)	S ( $\mu$ m)	Js/Jw (g/l)	Reference
(1) HTI-CTA	0.44	0.265	481	0.785	2
(2) PSf-TFC	2.44	-	340	0.600	3
(3) TFN-1	2.63	0.446	390	0.476	4
(4) TFN-2	2.57	1.57	-	0.594	5
(5) Hollow fiber-TFC-1	1.83	0.348	261	0.287	6
(6) TFC	0.77	0.11	238	0.319	7
(7) Hollow fiber-TFC-2	2.22	0.2	595	0.111	8
(8) SPPO/PSF	3.55	0.74	294	0.156	9
(9) SPEK/PSF/TFC	0.75	0.068	107	0.200	10
(10) PAN	2.04	1.57	290	0.229	11
(11) TFC-O	2.85	0.345	32	0.125	12
(12) TFC sPPSU	3.23	1.05	652	0.158	13
(13) MO-1	1.41	0.178	136	0.146	Current study

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