Supporting Information

Metal organic framework/Polyelectrolyte composites for water vapor sorption applications

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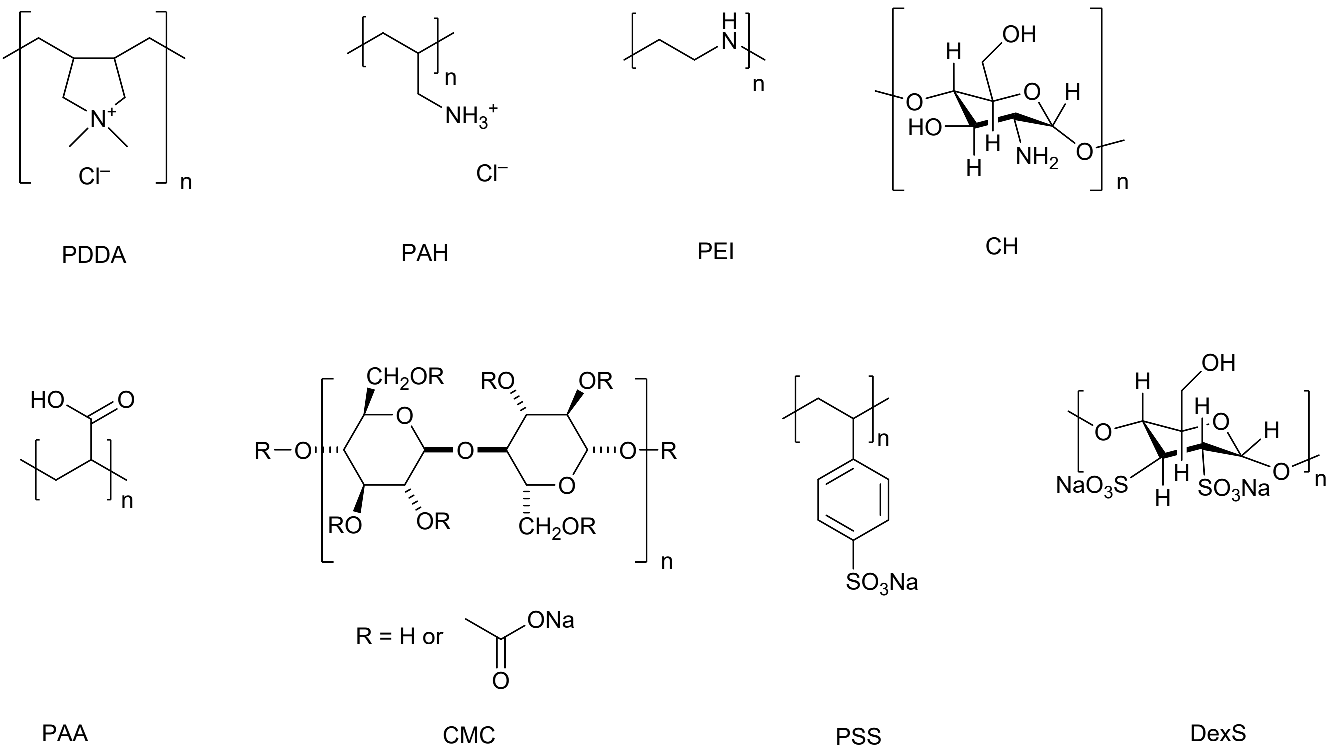
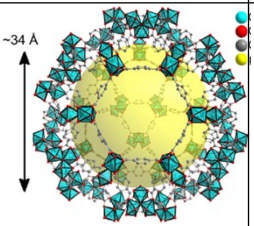
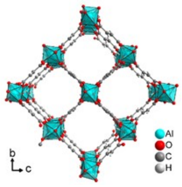
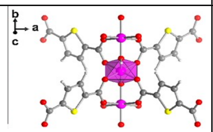
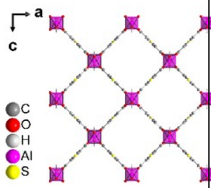
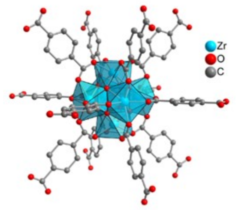
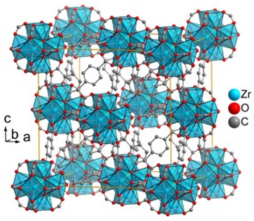
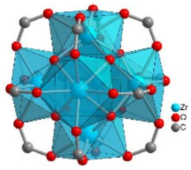
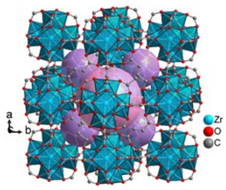
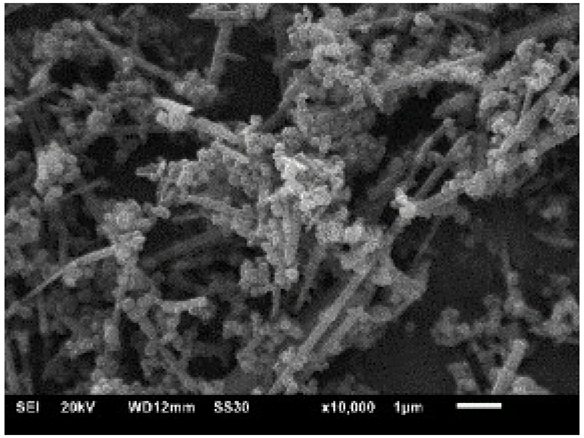


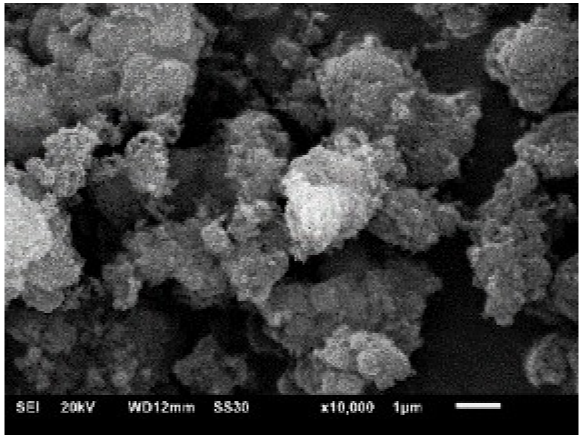
Fig. S1. Structure of the used polyelectrolytes :.poly(diallyldimethylammonium chloride) (PDDA), polyallylamine hydrochloride (PAH), polyethyleneimine (PEI), and chitosan (CH), polyacrylic (PAA), carboxymethyl cellulose (CMC), polystyrene sulfonic acid sodium salt (PSS), dextran sulfate (DexS).

Table S2. Structure of used MOFs

MOF	MIL-101(Cr)	Basolite®A520; Al fumarate	MIL-53 (Al)-TDC	UiO-66	Zr fumarate (MIL-801)
Metal ion	Cr	Al	Al	Zr	Zr
Ligand	1,4-benzene dicarboxylic (terephthalic) acid	Fumaric acid	2,5-thiophene dicarboxylic acid (TDC)	1,4-benzene dicarboxylic (terephthalic) acid	Fumaric acid
Pore structure			 	 	 



a



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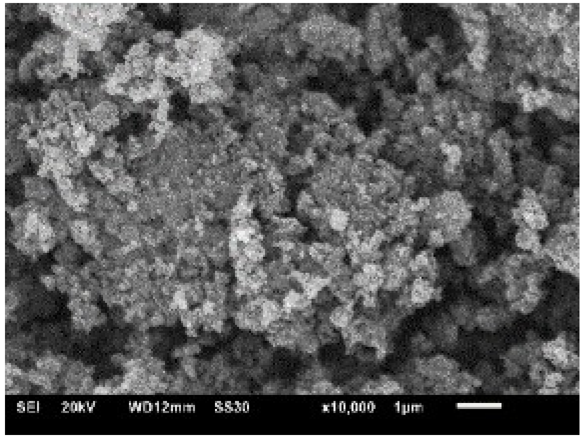

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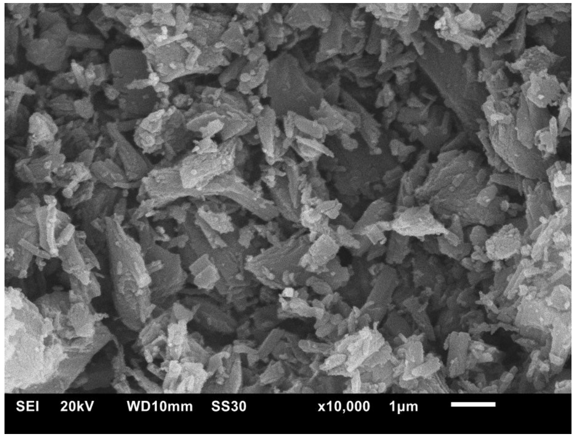

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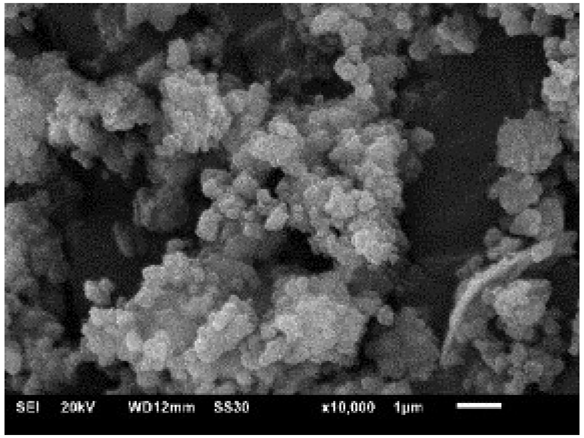

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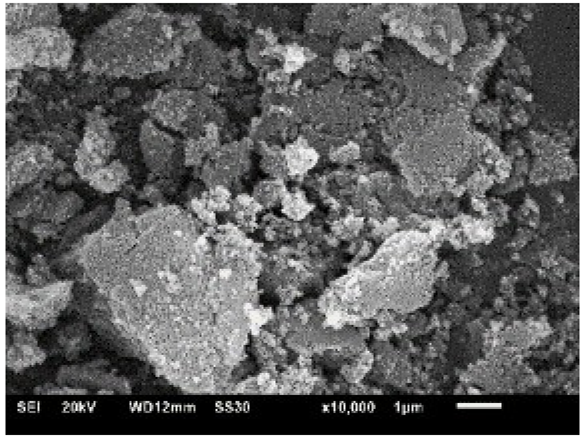
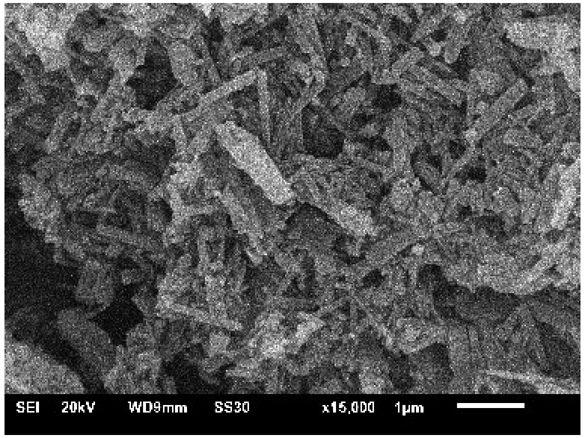
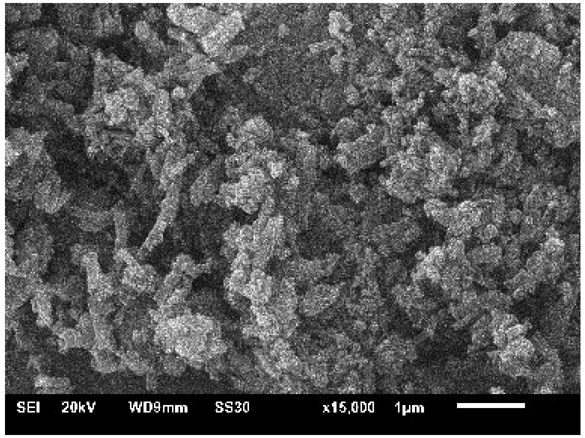


f

Fig. S3. SEM images of the neat MOFs: MIL-101(Cr) (a), Al-fum (b), Basolite® A520 (c), MIL-53-TDC (d), UiO-66 (e), Zr-fum (fe).



a



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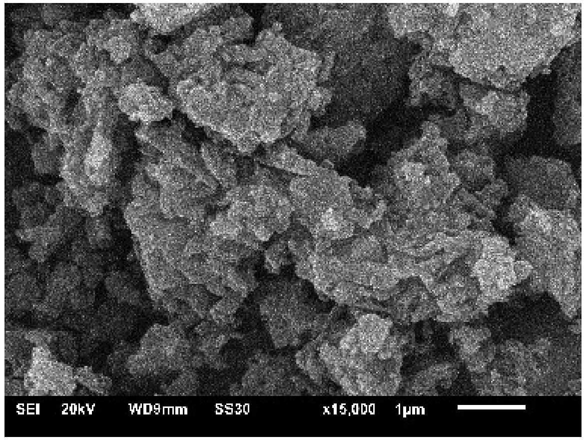

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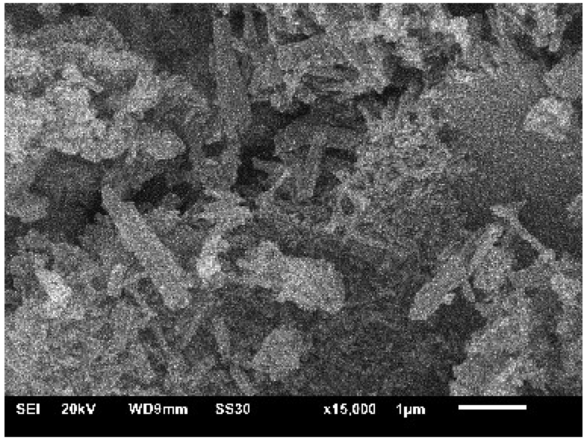
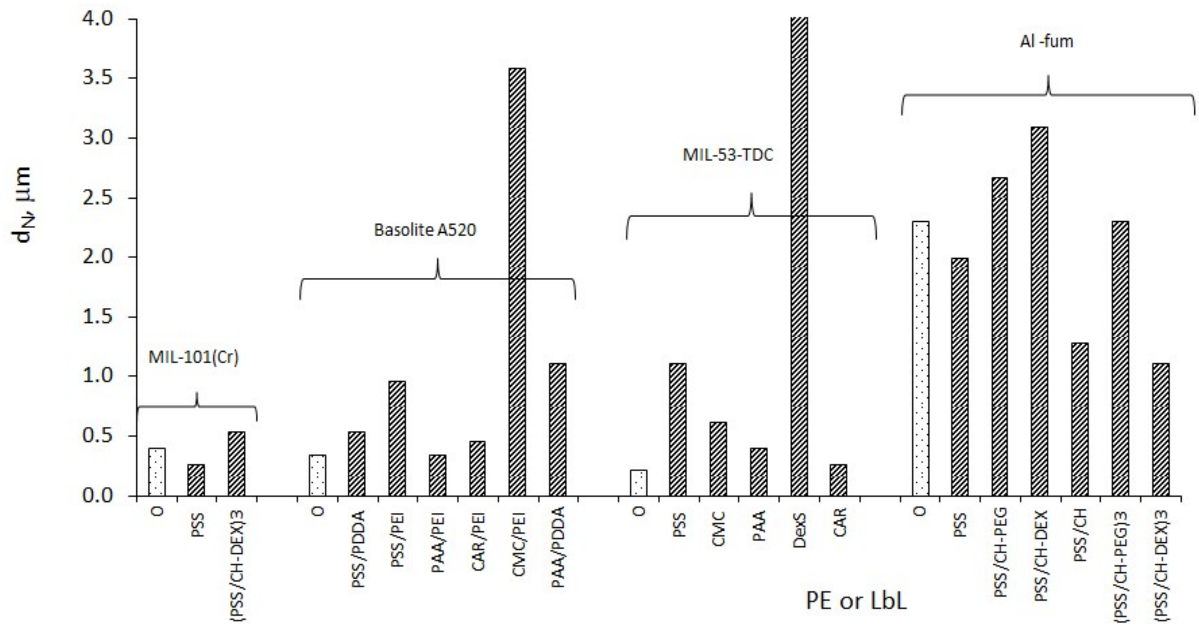
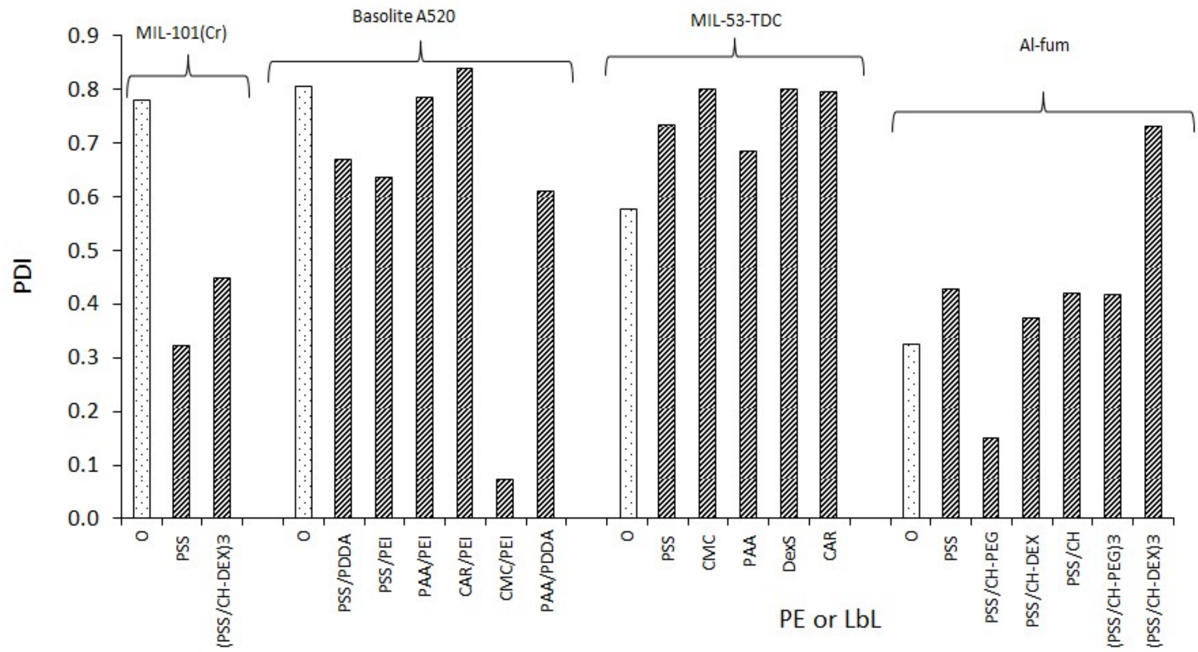


d

Fig. S4. SEM images of MOF MIL-53-TDC modified with PE: PAA (a), CMC (b), DexS (c), CAR (d).

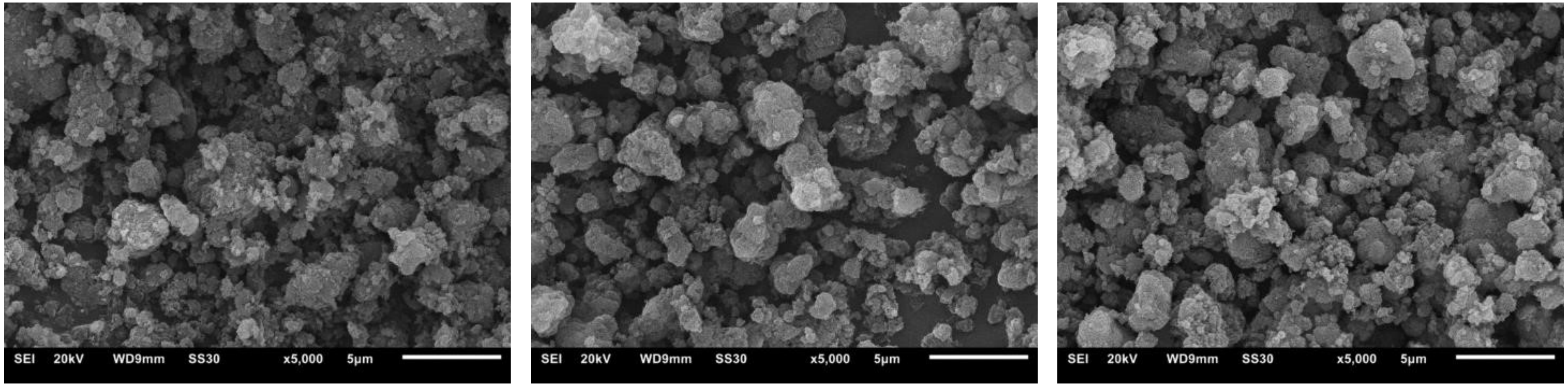


a



b

Fig. S5. Hydrodynamic diameter (d$_N$) (a) and polydispersity index (PDI) (b) of MOF powders coated with a single polyelectrolyte layer or a LbL shell as indicated on the X-axis, determined by DLS in a water dispersion.



a b c

Fig. S6. SEM microphotographs of Al fumarate modified with a LbL shell: PSS (a), $(PSS/CH\text{-}DEX)_3$ (b), $(PSS/CH\text{-}PEG)_3$ (c).

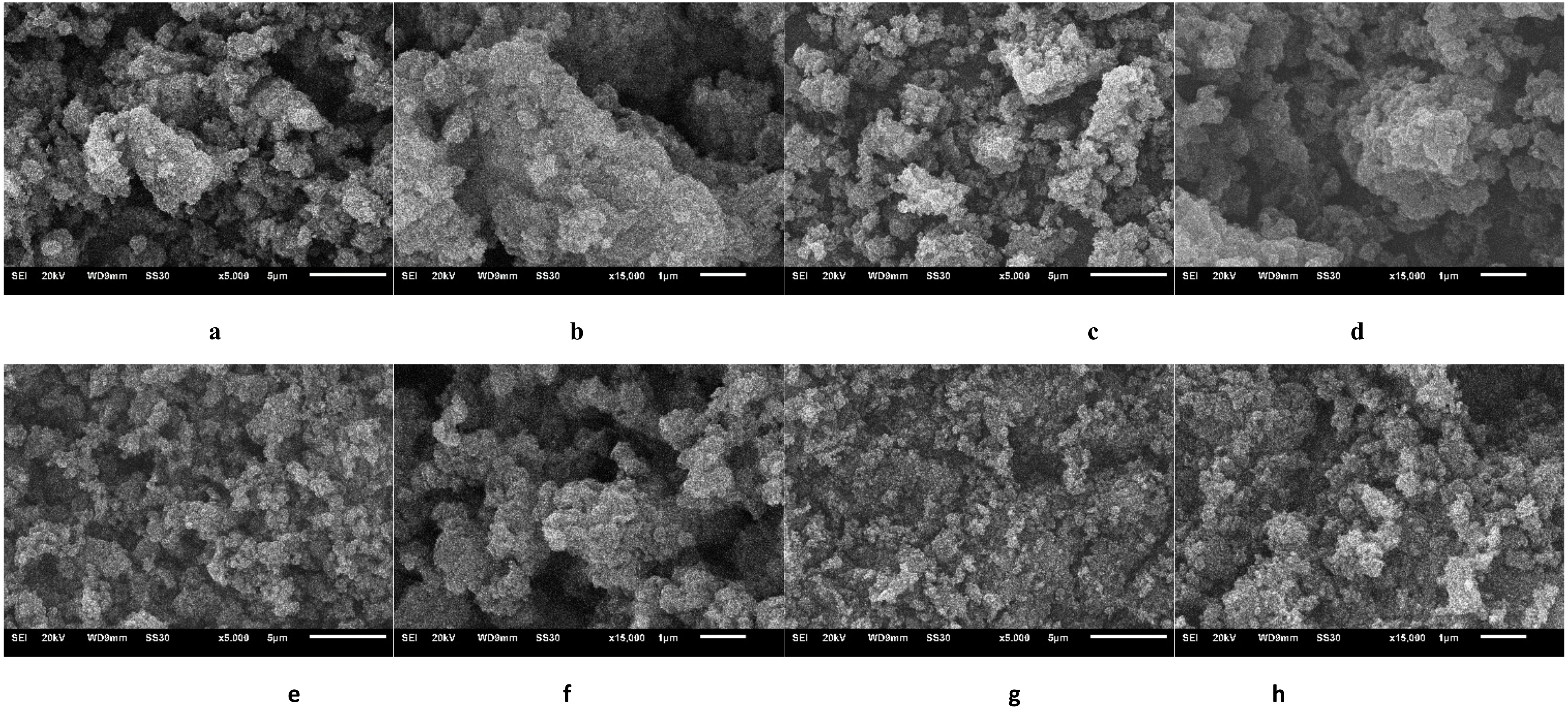


Fig. S7. SEM images of MOF Basolite® A520 modified with a LbL shell of PSS/PDDA (a,b), CMC/PEI (c,d), PAA/PDDA (e,f), PAA/PEI (g,h).

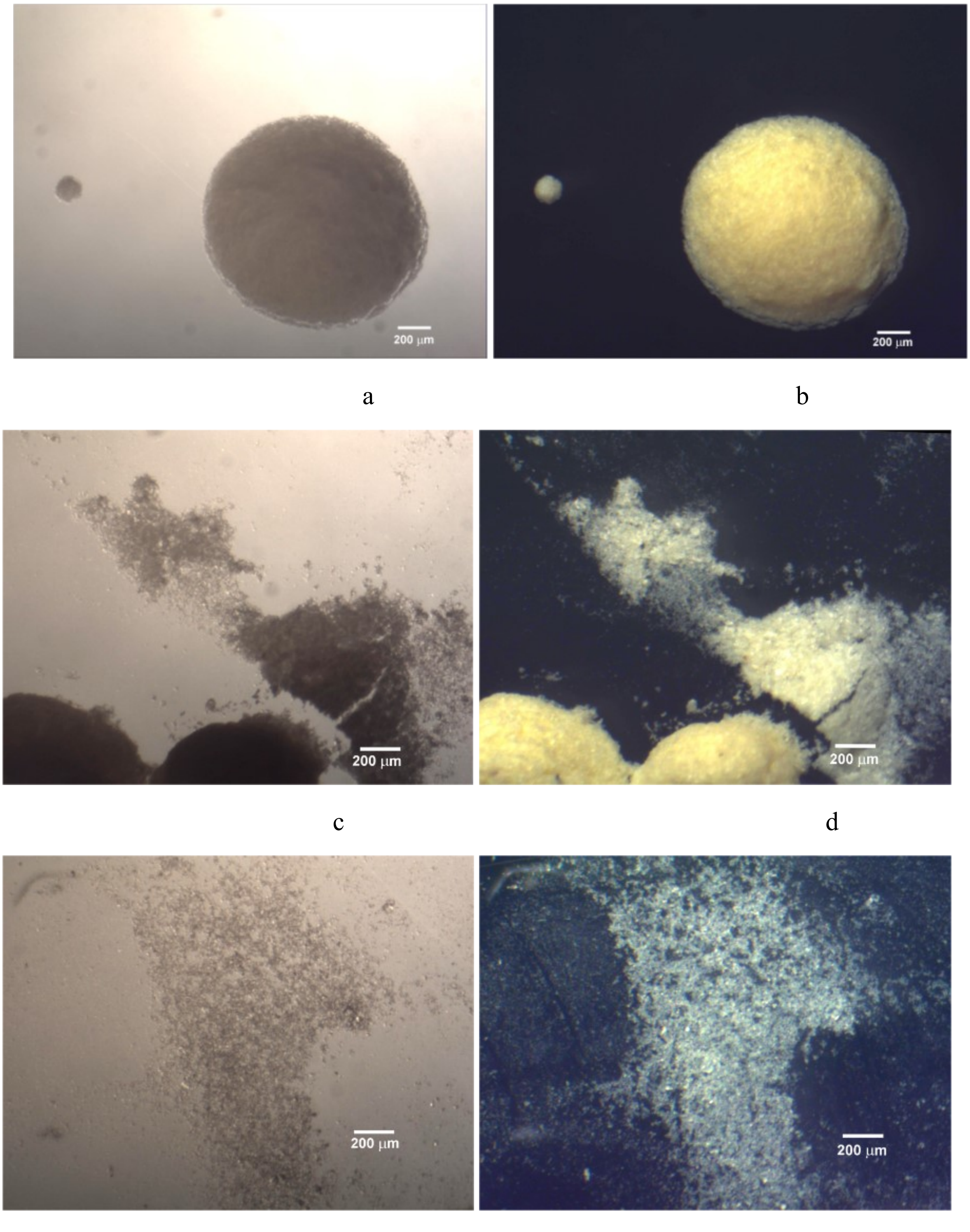


Fig. S8. Micrographs of dry Al fumarate microparticles coated with a $(PSS/PAH\text{-}FITC)_2$ shell of different degree of aglomeration obtained in transmitted (a,c,e) and reflected (b,d,f) light. Yellow color shows the distribution of LbL shell containing FITC-labled PAH 15 kDa. T=25 ^{0}C. The images were taken using a LOMO MSP-1 option 5 stereoscopic microscope equipped with a TCA-5.0C camera.

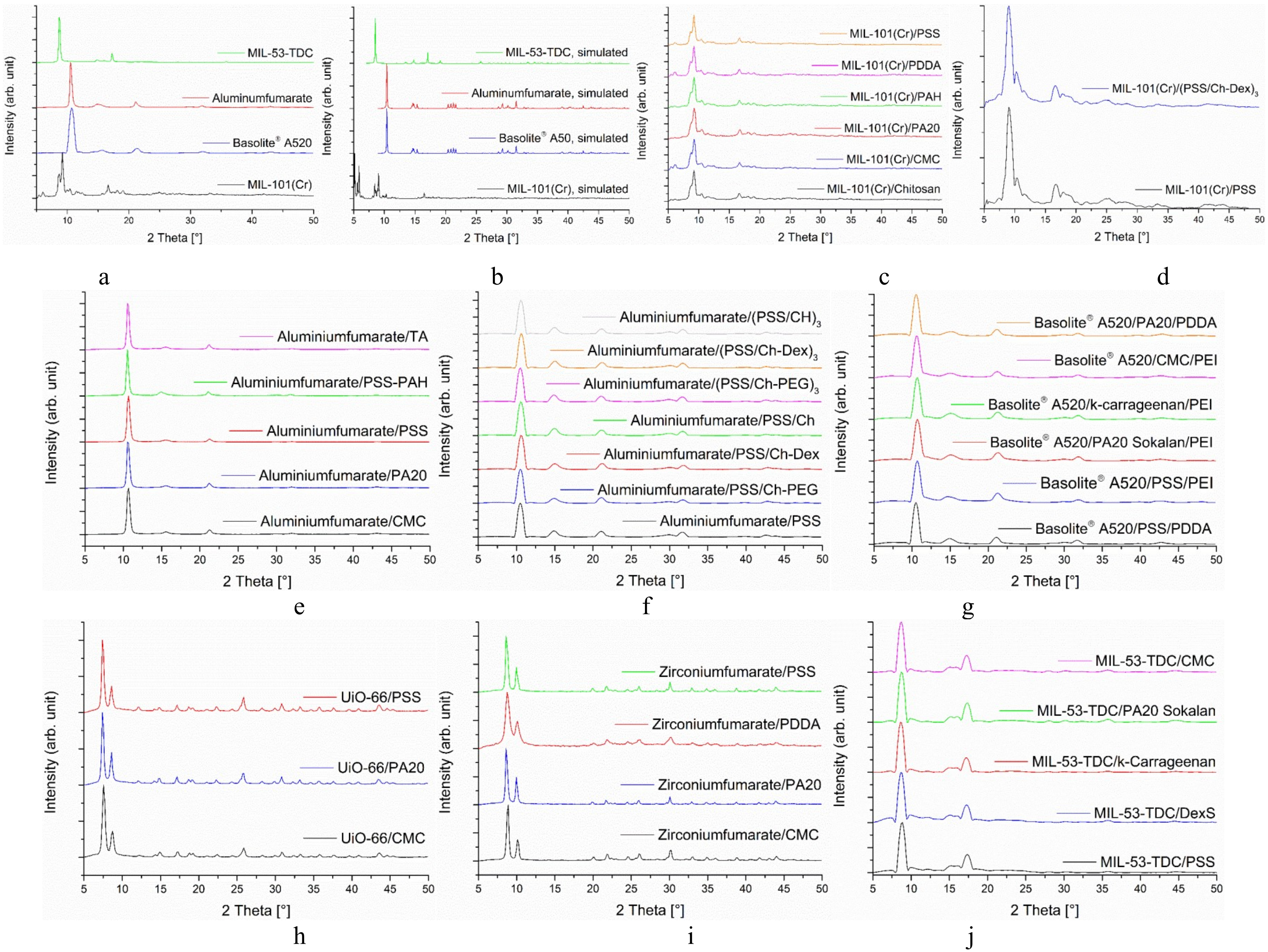
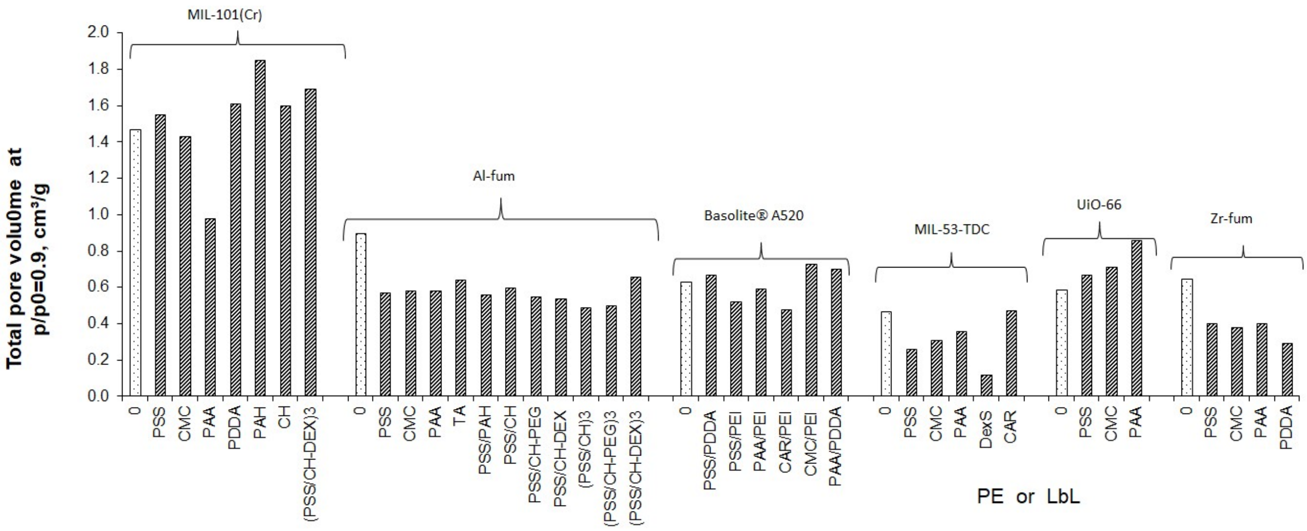
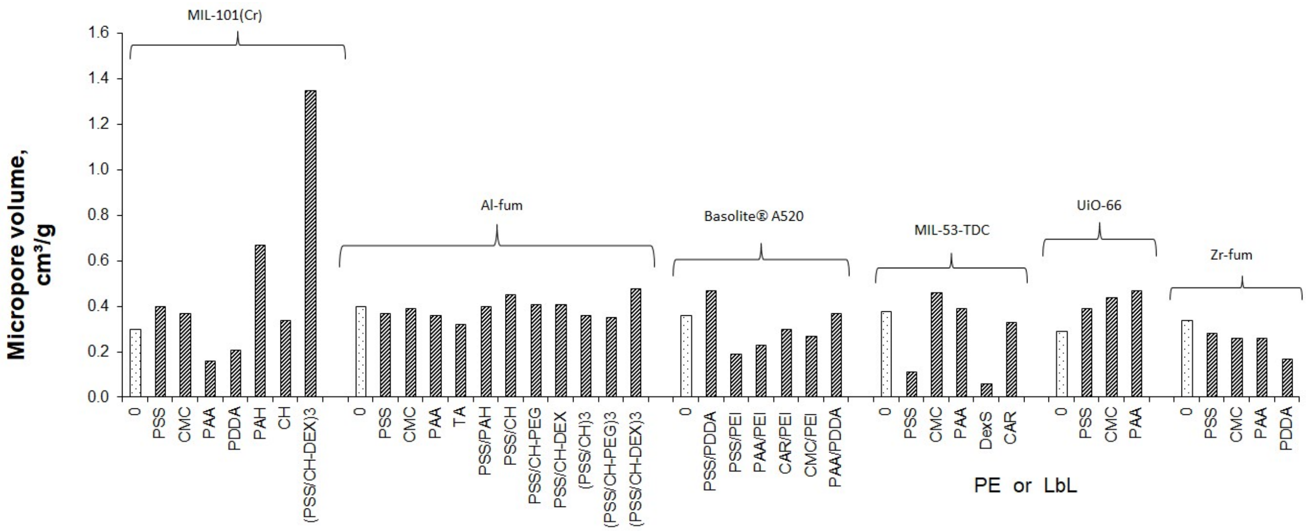


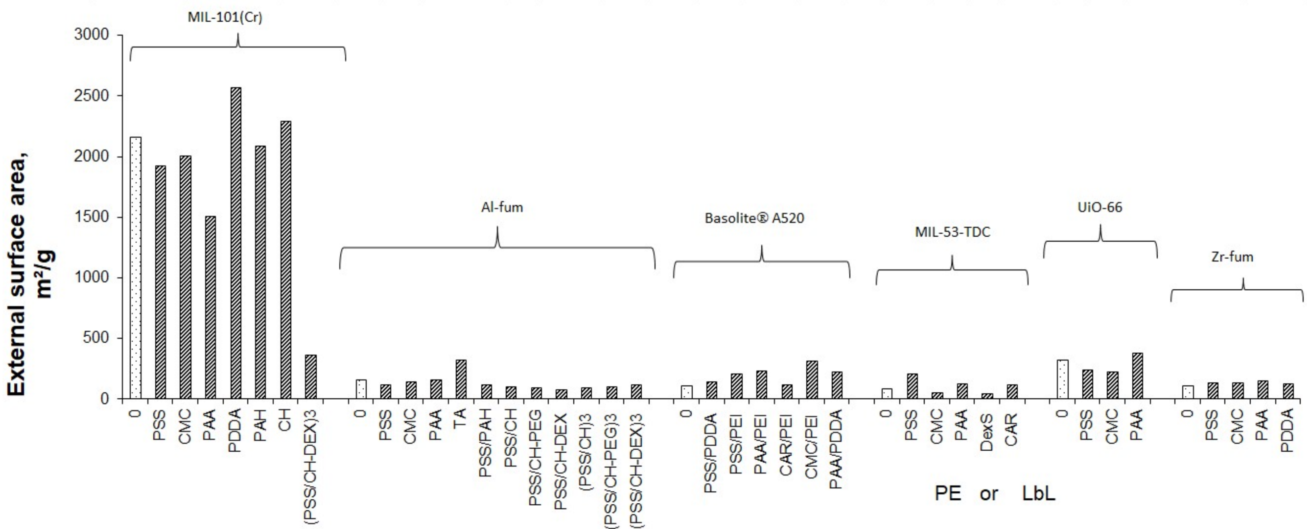
Fig. S9. PXRDs of the pristine MOF powders (a –experiment, b - calculated), MOF/PE, and MOF/LbL composites (c-j).



a



b



c

Fig. S10. Total pore volume (a), micropore volume (b), and external surface area (c) of the MOFs after single polyelectrolyte modification as evaluated by nitrogen sorption.

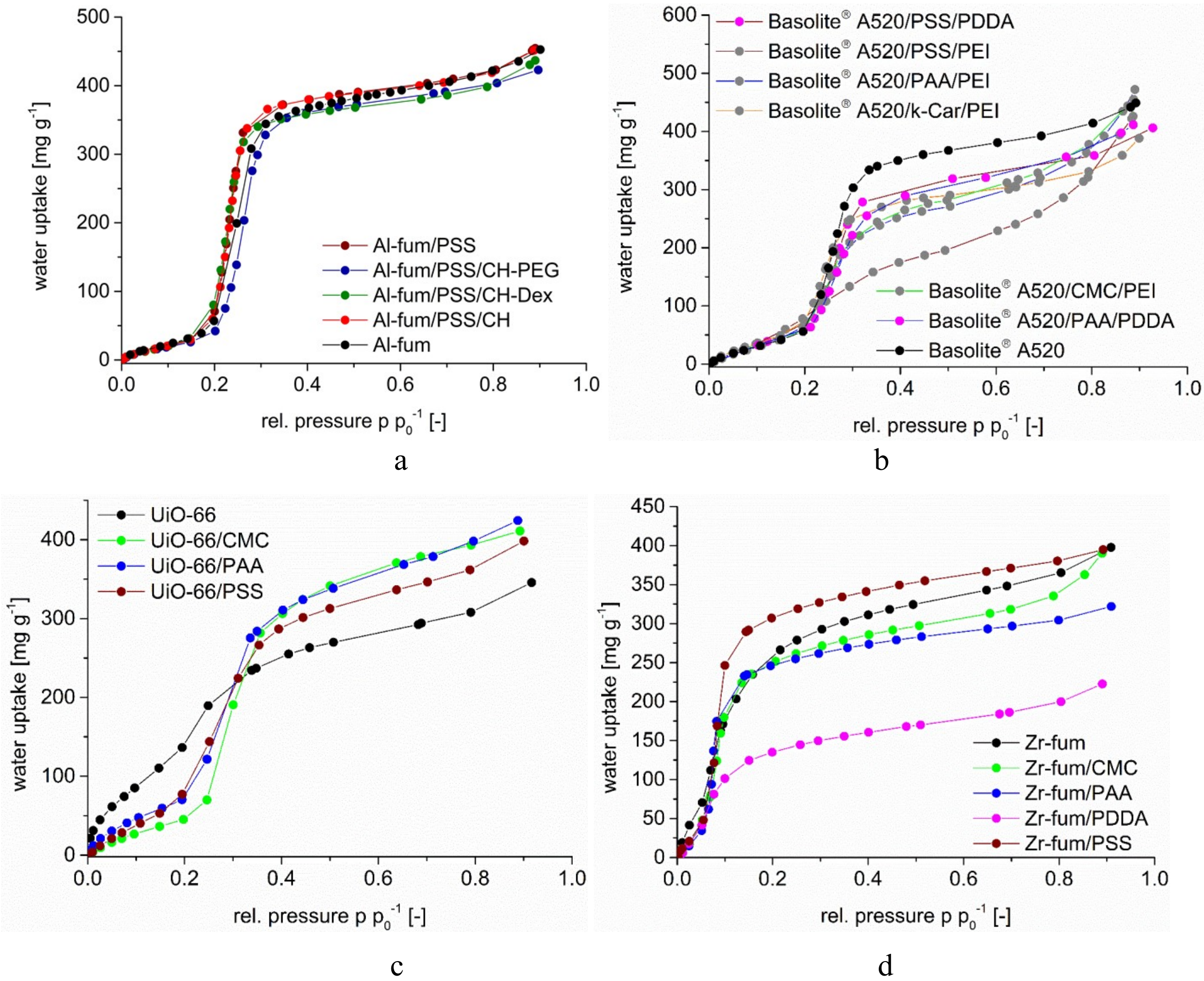
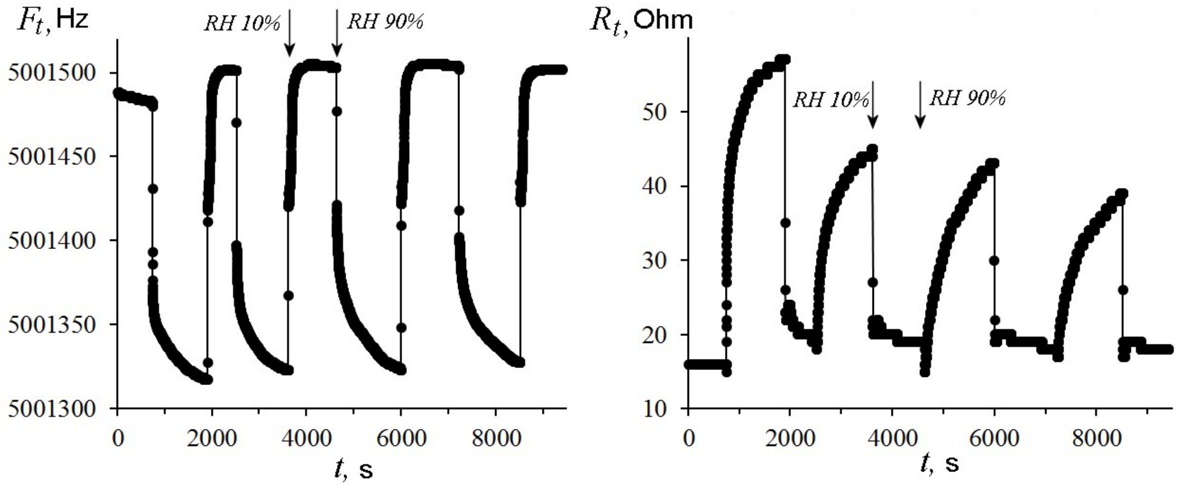


Fig. S11. Isotherms of water vapor sorption by MOF/PE and MOF/LbL composites: a) Al-fum, b), Basolite®A520, c) UiO-66, d) Zr-fum.



a b

F ig. S12. Changes of F_t (a) and R_t (b) of a 5 MHz resonator with Al-fum/$(PSS/PDDA)_3$ deposit in the process of alternately changing humidity. T = 25.4 °C.

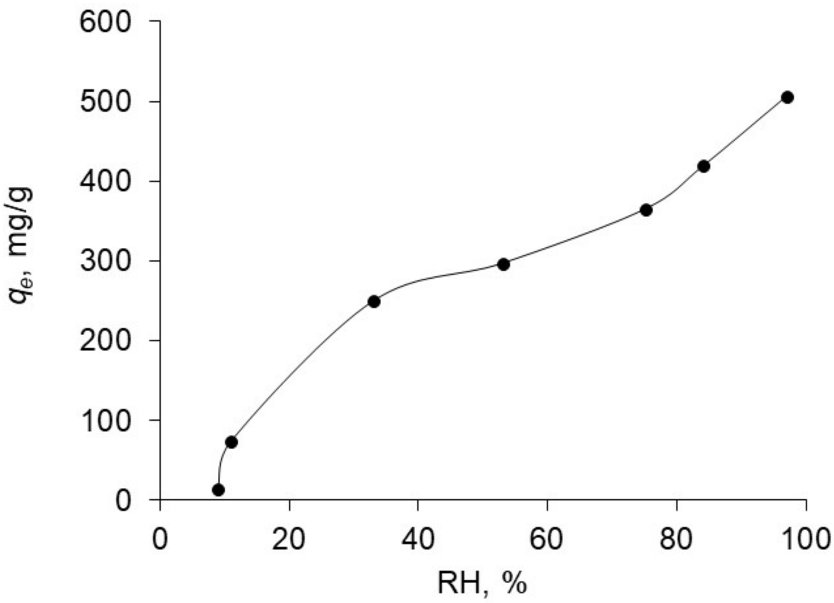


Fig. S13. Water uptake by Al-Fum at 26.4 ^{0}C.

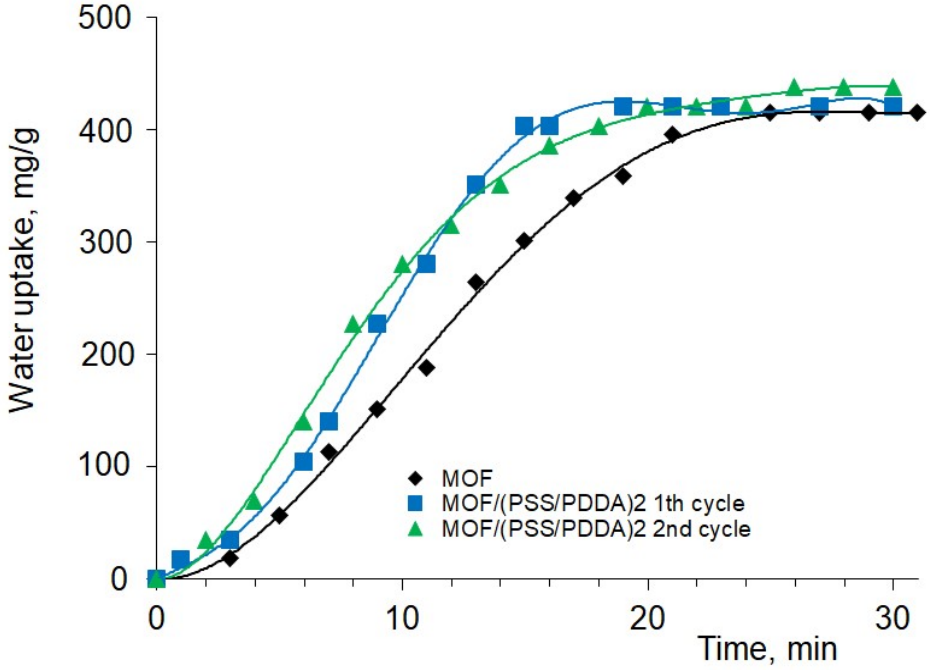


Fig. S14. Water vapor uptake by Al fumarate and Al fumarate / thick $(PSS/PDDA)_2$ shell composite ($23\ ^0C$, RH 70%).