Supplementary Materials

Water adsorption dynamics on metal-organic framework MOF-801: comparative study of loose, glued grains, and coatings

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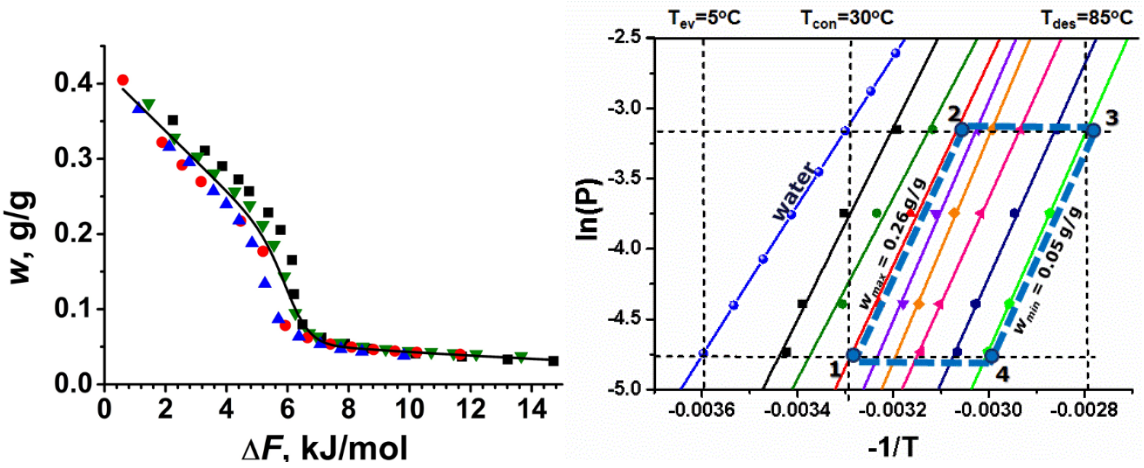


(a) (b)

Figure S1. Characteristic curve of water adsorption (a) and isosters (b) of water vapour adsorption on as-prepared MOF-801 powder. Dashed blue lines (b) represent the adsorption cooling cycle. Reprinted from Energy Conv. Manag., vol. 174, Solovyeva M., Gordeeva L., MOF-801 as a promising material for adsorption cooling: Equilibrium and dynamics of water adsorption, pages 356-363, copyright 2018, with permission of Elsevier.

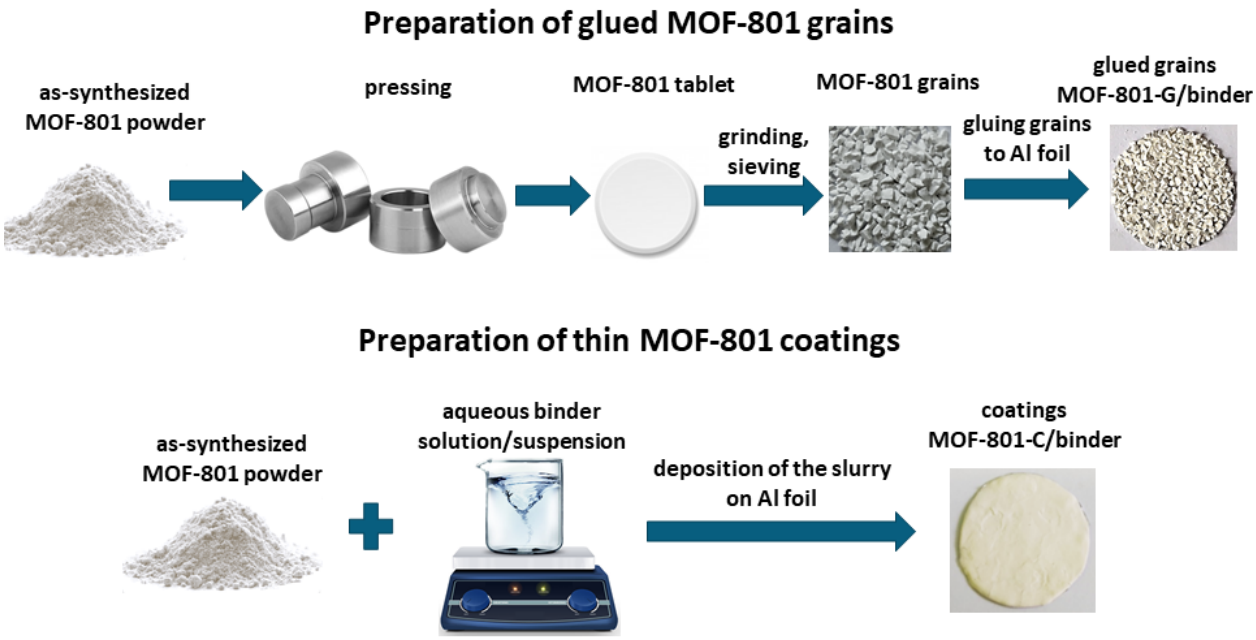


Figure S2. Schematic presentation of the preparation of MOF-801 beds composed of glued grains and coatings.

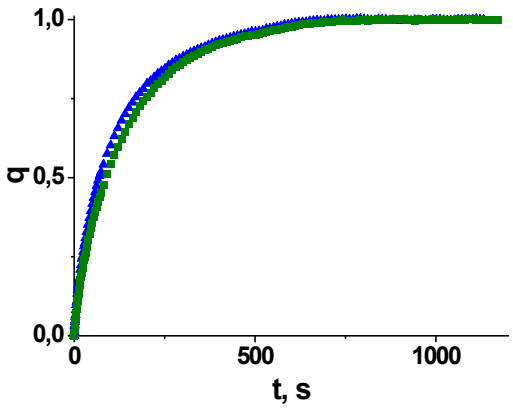


Figure S3. The kinetic curves of water vapour adsorption for the loose grains placed on the surface of aluminum foil (■) and placed on the bottom of the measuring cell (▲).

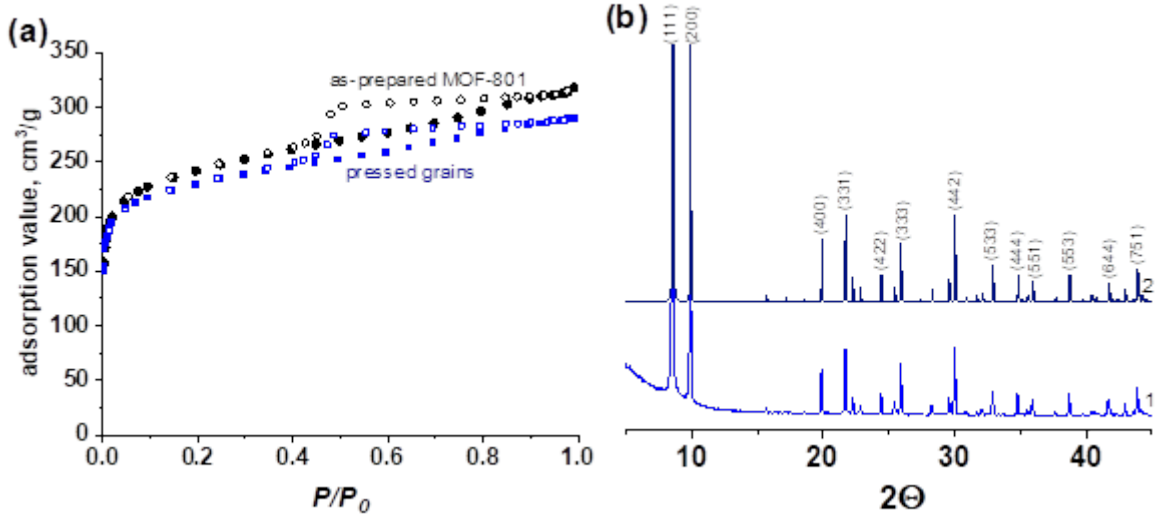
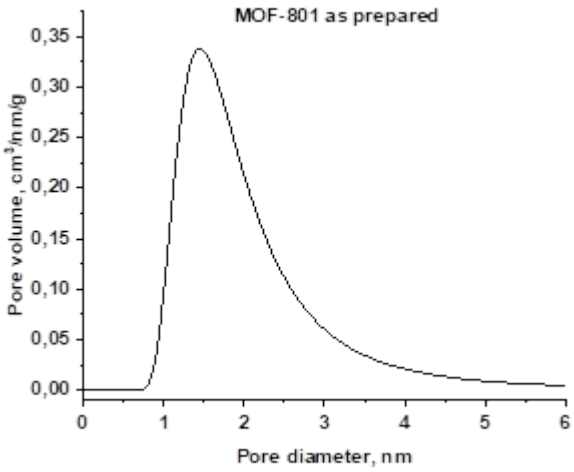
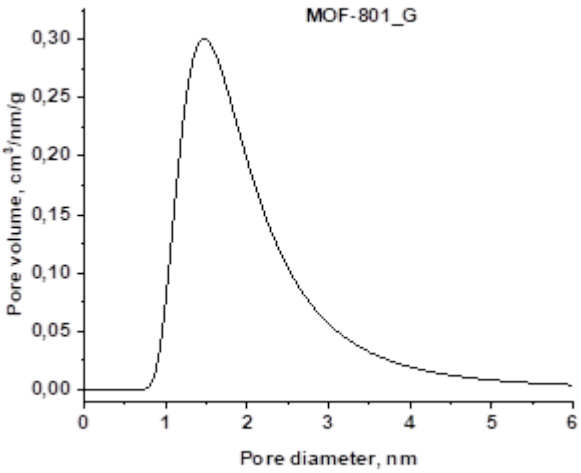


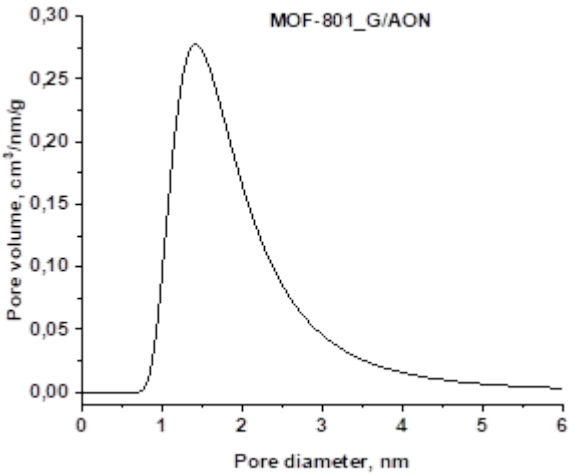
Figure S4. Isotherms of N_2 adsorption on as-prepared MOF-801 and pressed grains (a). Experimental (1) and calculated from single-crystal X-ray data (CIF-file) (2) PXRD patterns of the synthesized MOF-801 (b).



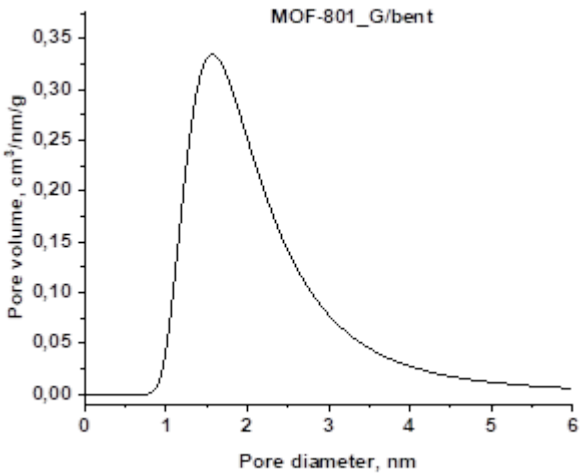
(a)



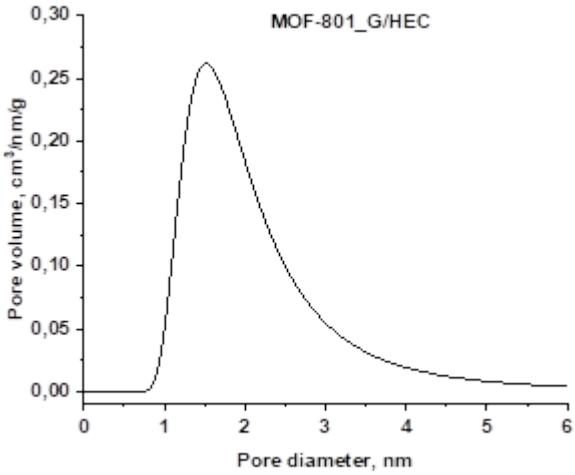
(b)



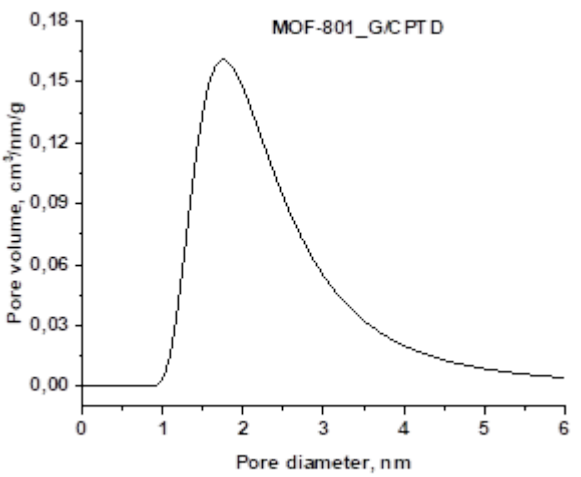
(c)



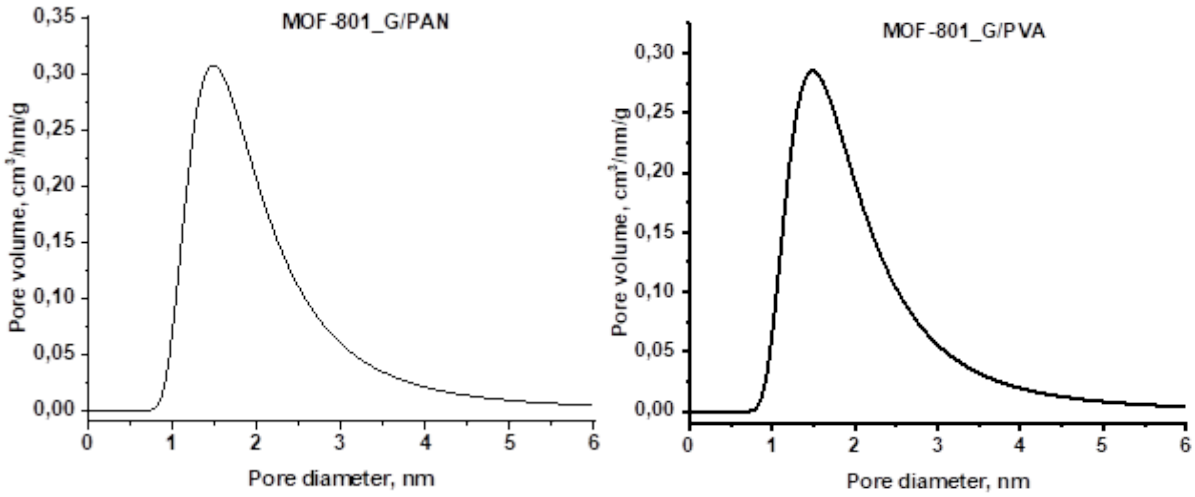
(d)



(e)



(f)



(g) (h)

Figure S5. Pore size distribution of as-prepared MOF-801 powder (a), MOF-801_G (b), MOF-801_G/AON_4.5 (c), MOF-801_G/bentonite_4.5 (d), MOF-801_G/HEC_4.5 (e), MOF-801_G/CPTD_4.5 (f), MOF-801_G/PAN_4.5 (g), and MOF-801_G/PVA_4.5 (h).

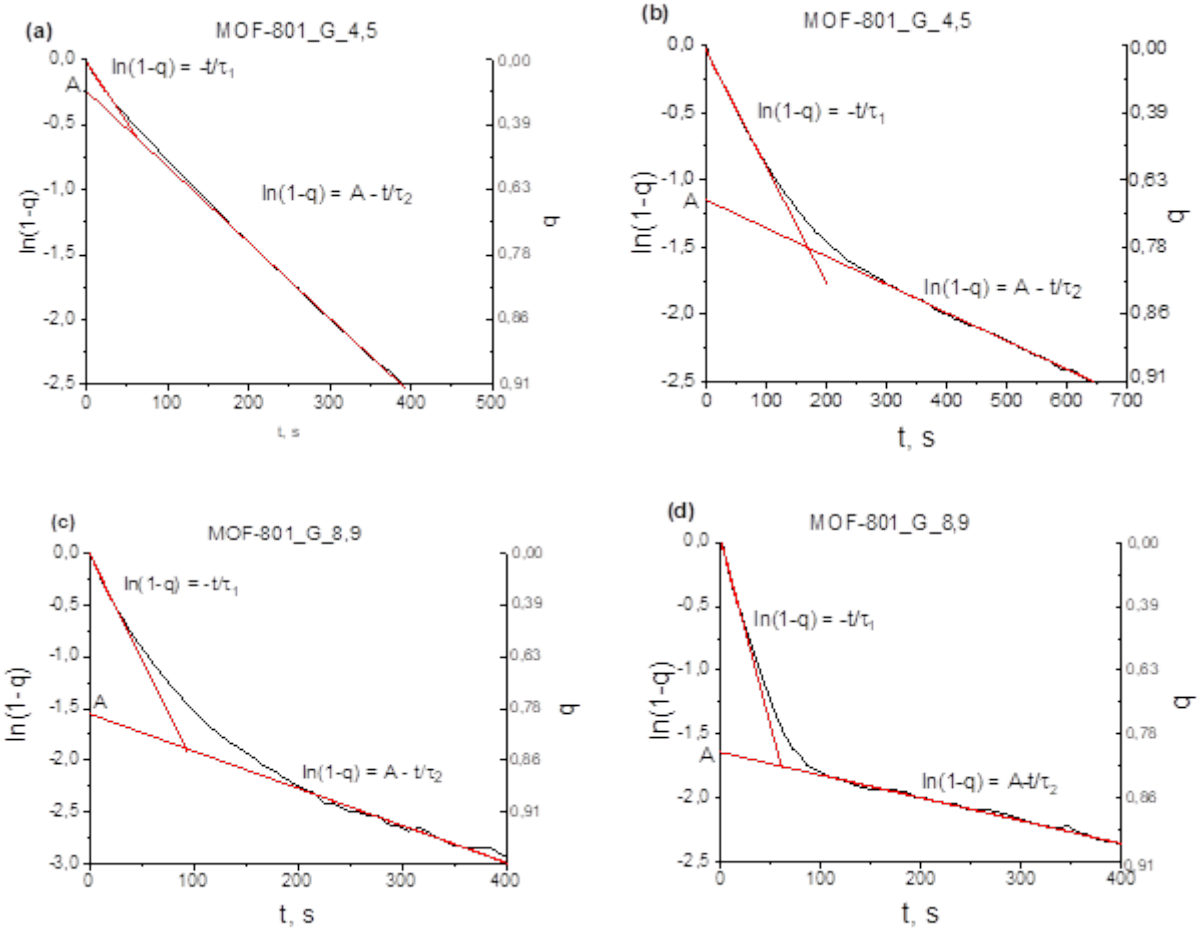
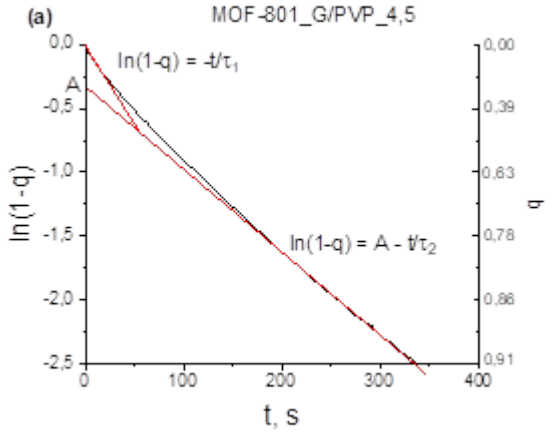
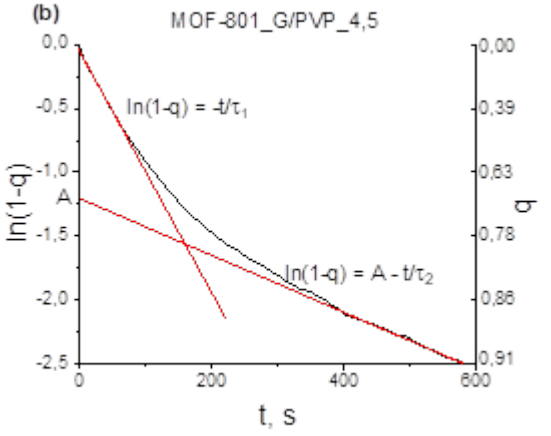
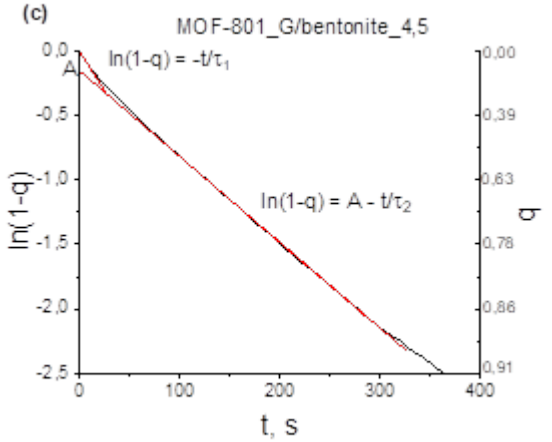
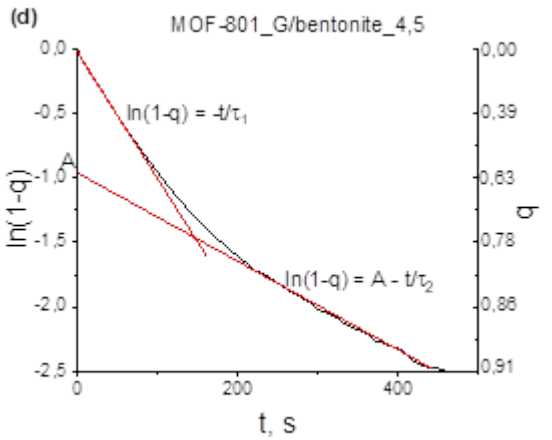


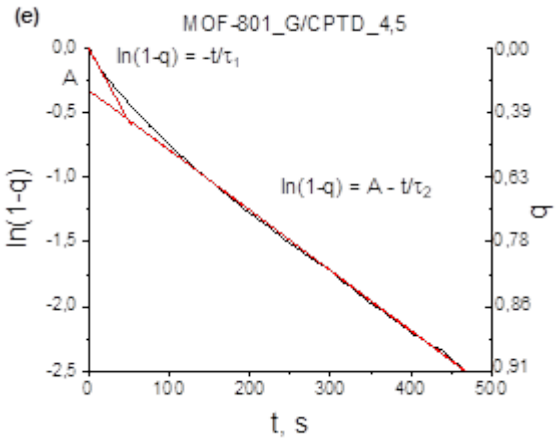
Figure S6. The kinetic curves of water adsorption on (a, c) and desorption from (b, d) reference beds of loose grains MOF-801_G_4.5 (a, b) and MOF-801_G_8.9 (c, d).

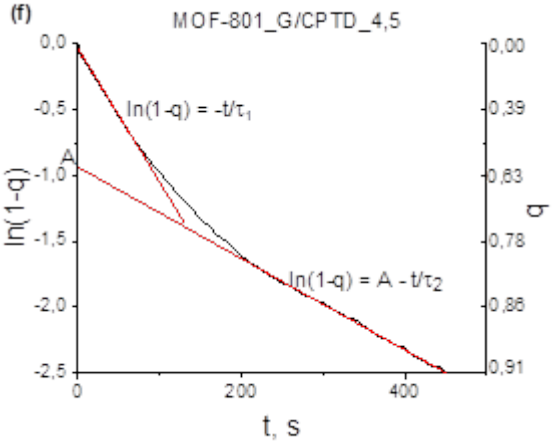

(a)
MOF-801_G/PVP_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s

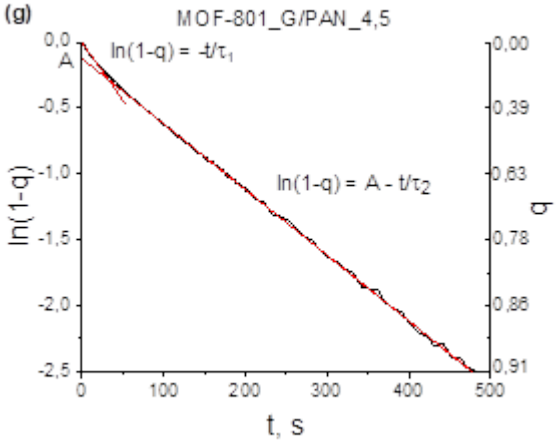

(b)
MOF-801_G/PVP_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s

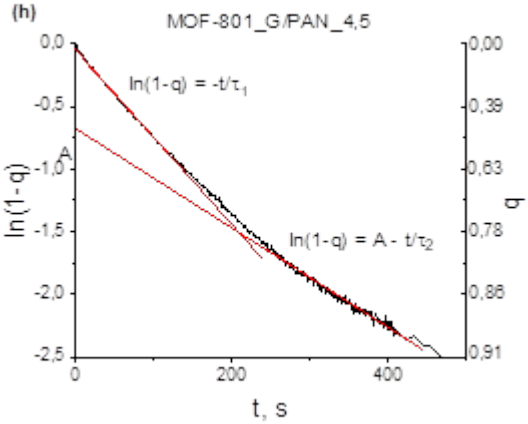

(c)
MOF-801_G/bentonite_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s


(d)
MOF-801_G/bentonite_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s


(e)
MOF-801_G/CPTD_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s


(f)
MOF-801_G/CPTD_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s


(g)
MOF-801_G/PAN_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s


(h)
MOF-801_G/PAN_4,5
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
A
ln(1-q)
q
t, s

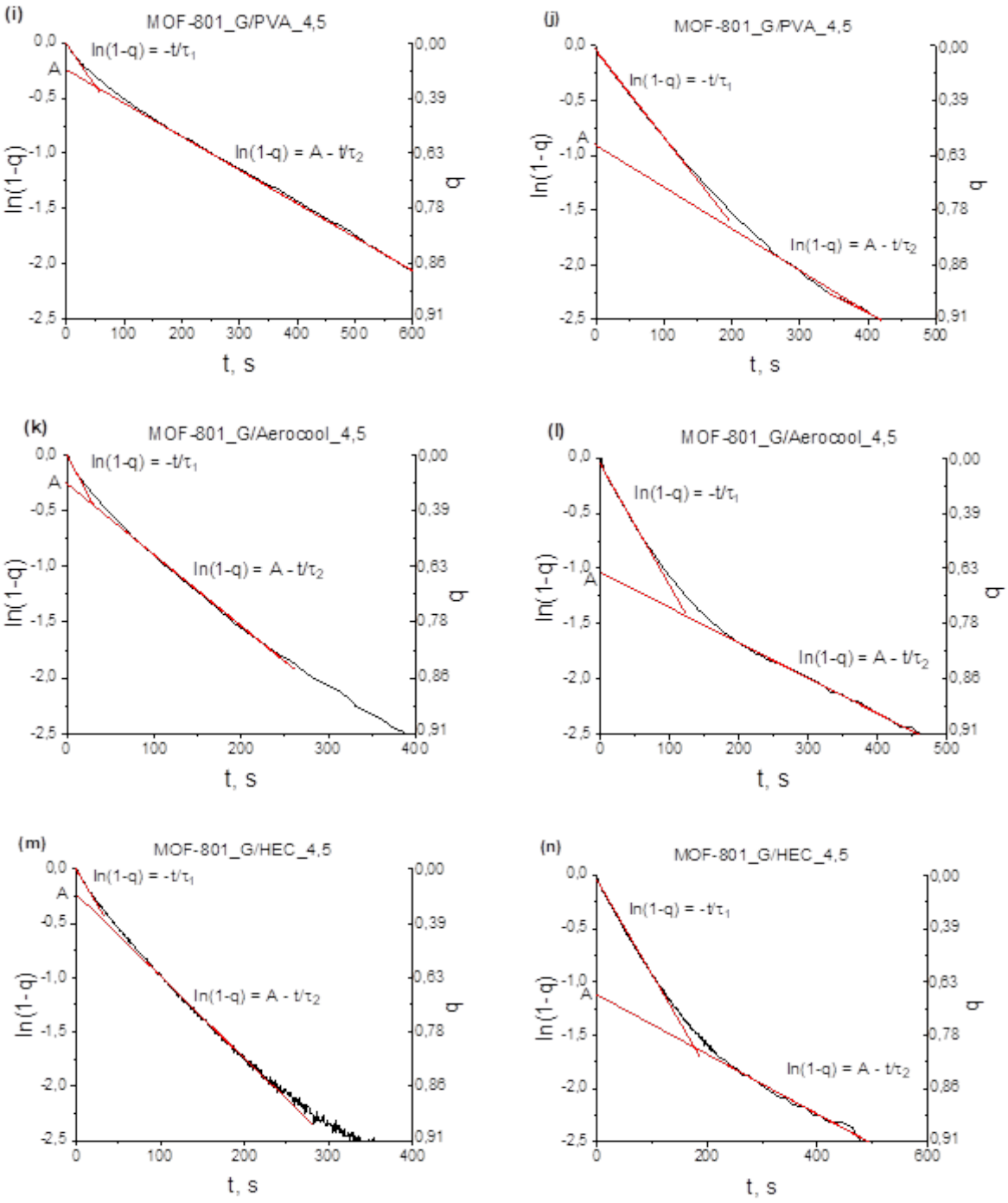
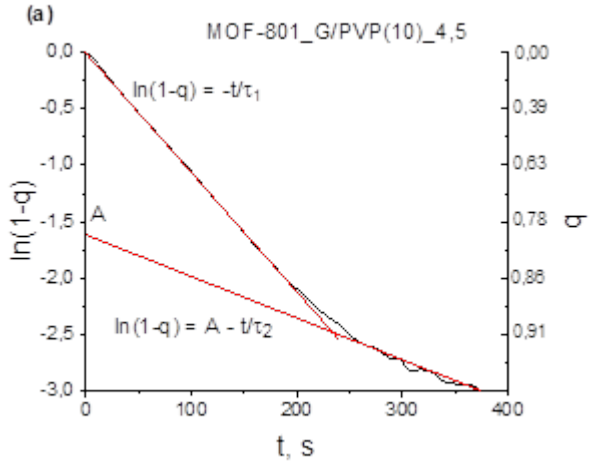
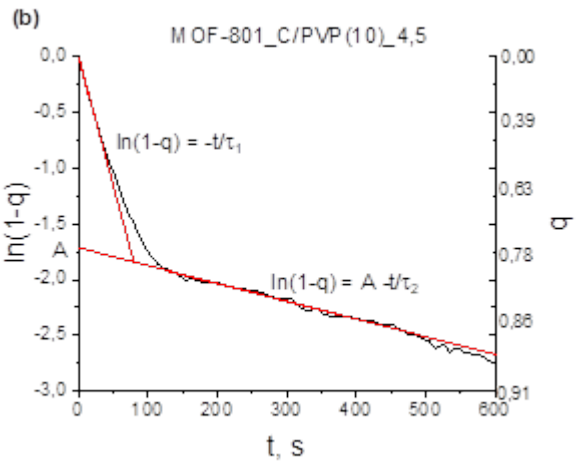
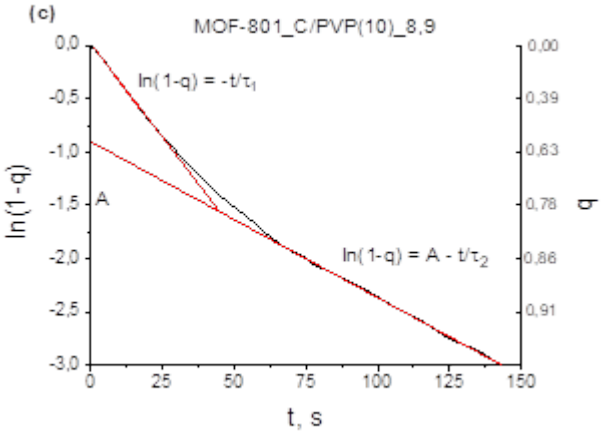
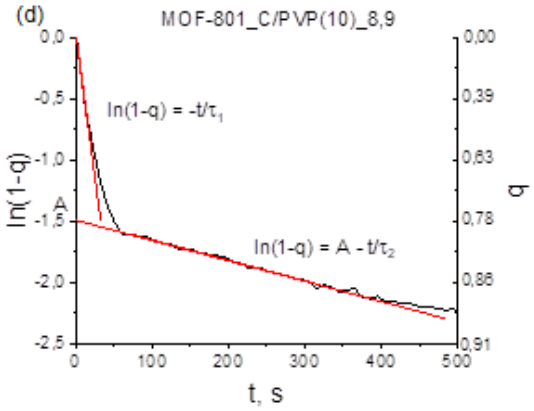


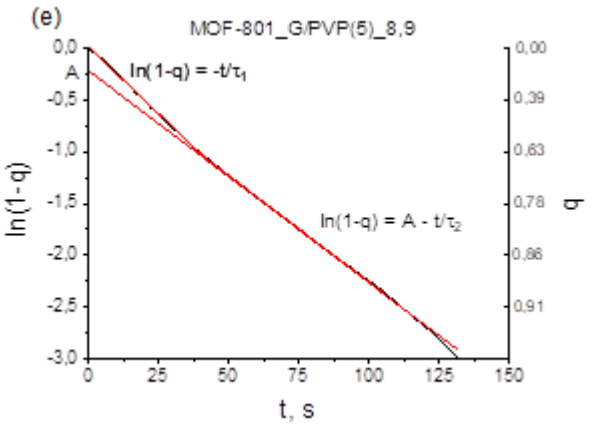
Figure S7. The kinetic curves of water adsorption on (left) and desorption from (right) beds of glued grains MOF-801_G/PVP_4.5 (a, b), MOF-801_G/bentonite_4.5 (c, d), MOF-801_G/CPTD_4.5 (e, f), MOF-801_G/PAN_4.5 (g, h), MOF-801_G/PVA_4.5 (i, j), MOF-801_G/Aerocool_4.5 (k, l), and MOF-801_G/HEC_4.5 (m, n).

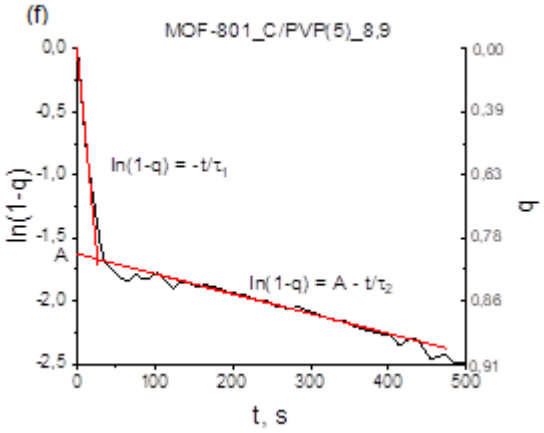

(a)
MOF-801_G/PVP(10)_4,5
ln(1-q) = -t/τ1
A
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s

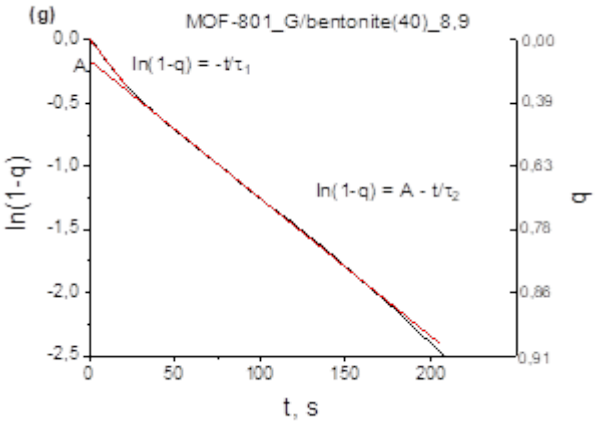

(b)
MOF-801_C/PVP(10)_4,5
ln(1-q) = -t/τ1
A
ln(1-q) = A -t/τ2
ln(1-q)
q
t, s

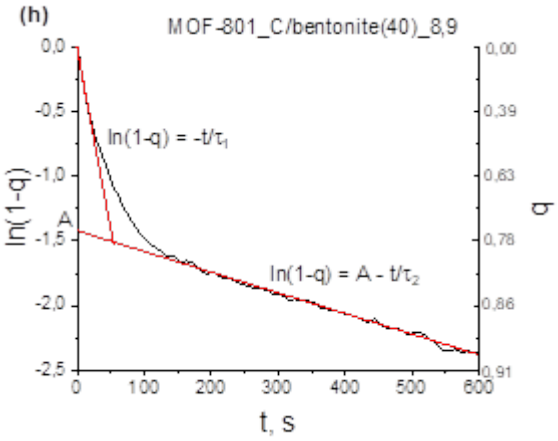

(c)
MOF-801_C/PVP(10)_8,9
ln(1-q) = -t/τ1
A
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s


(d)
MOF-801_C/PVP(10)_8,9
ln(1-q) = -t/τ1
A
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s


(e)
MOF-801_G/PVP(5)_8,9
A
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s


(f)
MOF-801_C/PVP(5)_8,9
ln(1-q) = -t/τ1
A
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s


(g)
MOF-801_G/bentonite(40)_8,9
A
ln(1-q) = -t/τ1
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s


(h)
MOF-801_C/bentonite(40)_8,9
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A
ln(1-q) = A - t/τ2
ln(1-q)
q
t, s

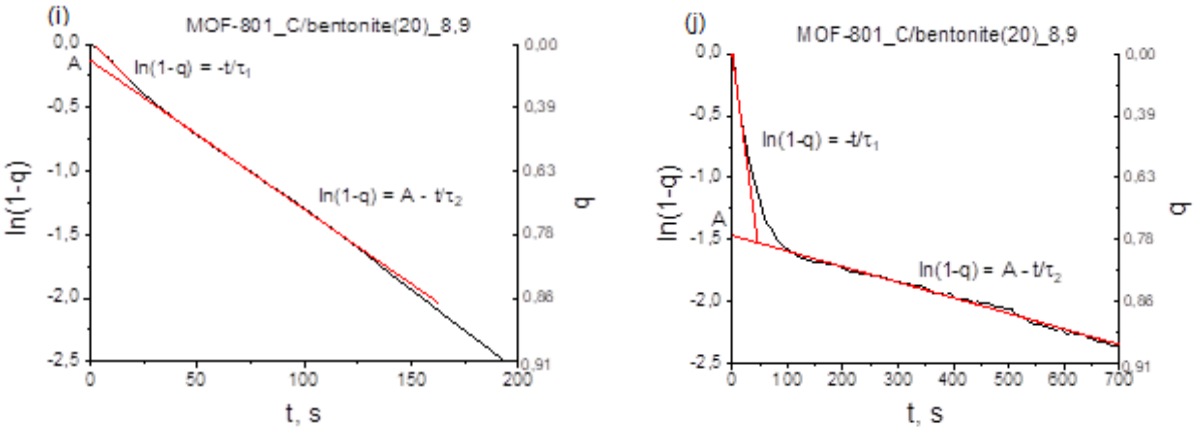

Figure S8. The kinetic curves of water adsorption on (left) and desorption from (right) beds of coatings MOF-801_C/PVP(10)_4.5 (a, b), MOF-801_C/PVP(10)_8.9 (c, d), MOF-801_C/PVP(5)_8.9 (e, f), MOF-801_C/bentonite(40)_8.9 (g, h), and MOF-801_C/bentonite(20)_8.9 (i, j).