Supporting Information for

Harvesting Water from Air with High-Capacity, Stable Furan-Based Metal–Organic Frameworks

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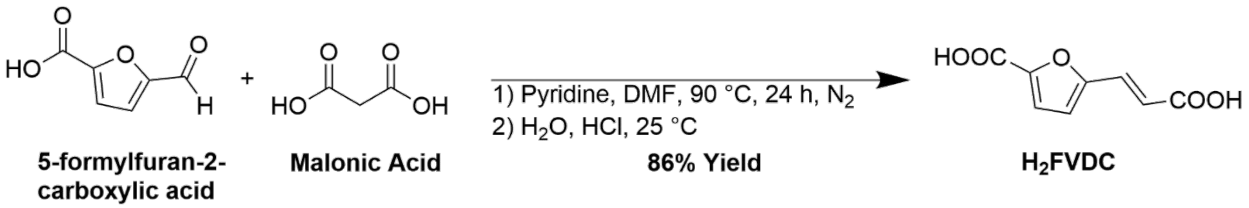
Section S1. General Methods and Materials

All chemicals were purchased commercially and used without any further purification. 5-formylfuran-2-carboxylic acid, Furan-2,5-dicarbaldehyde, and Aluminum Sulfate Octadecahydrate were purchased from Fisher Scientific with ≥98.0%, ≥98.0%, and 99.999% purity respectively. Pyridine, *N*,*N*-Dimethylformamide, Methanol, HCl, NaOH, Dimethyl sulfoxide-d_6, D_2O, and NaOD (40 wt. % in D_2O) were purchased from Sigma Aldrich. Argon, Helium, and Nitrogen gases were purchased from Linde Air with ultra-high purity (99.999% pure). Microwave reactions were conducted using the CEM Discover® Microwave Synthesizer. Elemental analysis measurements were performed using the Perkin Elmer CHNS 2400 Series II Analyzer.

Section S2. Synthetic Procedures

Synthesis of (*E*)-5-(2-carboxyvinyl)furan-2-carboxylic acid (H_2FVDC):



Step 1: In a 25 mL round bottomed flask with a stirrer bar and under a N_2 atmosphere, 2.228 g of malonic acid (21.41 mmol, 3 equiv.) was dissolved in 4.800 mL of *N*,*N*-Dimethylformamide. Next, 1.000 g of 5-formylfuran-2-carboxylic acid (7.138 mmol, 1 equiv.) was added to the solution and stirred until it fully dissolved. Following that, 0.600 mL of pyridine (7.42 mmol, 1.04 equiv.)

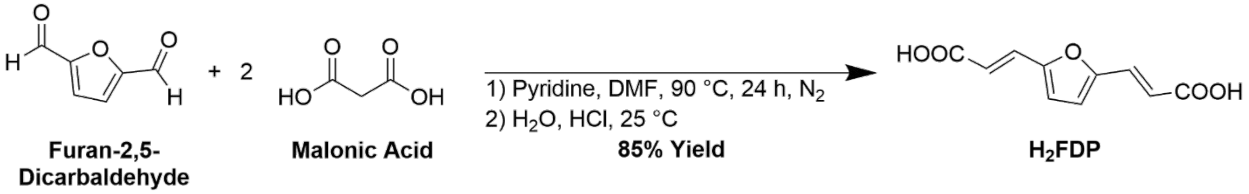
was added to the solution dropwise. The prepared solution was then heated by immersing the round-bottomed flask in a 90 ˚C oil bath with a water-cooled condenser connected on top of the flask. The reaction was left to run for 24 hours while being under a N_2 atmosphere.

Step 2: The solution was allowed to cool down to room temperature, and then was added to a 100 mL beaker with a stirrer bar. To the solution, 8.490 mL of deionized H_2O was added while stirring. Next, 1.770 mL (21.41 mmol, 3 equiv.) of 12.1 M aqueous HCl was added to the solution dropwise while stirring. The precipitate collected was then filtered.

Step 3 (optional): The obtained product was further purified using acid-base extraction. First, a solution was prepared by adding 3.295 mL of 5 M aqueous NaOH solution to 30.0 mL of deionized water in a 100 mL beaker. Second, the product obtained in **Step 2** was completely dissolved in the solution using a stirrer bar and then filtered. The filtrate then had 4.500 mL of 12.1 M aqueous HCl added to it dropwise in another 100 mL beaker, reprecipitating the product in the process. The product was then filtered and washed with 3 x 15 mL of deionized water, then dried at 110 ˚C in vacuo. Yield: 1.116 g, 86%.

^{1}H NMR (500 MHz, DMSO-d_6) δ 13.00 (s, 2H), 7.42 (d, J = 15.9 Hz, 1H), 7.28 (d, J = 3.6 Hz, 1H), 7.06 (d, J = 3.6 Hz, 1H), 6.35 (d, J = 15.9 Hz, 1H) (Figure S1). ^{13}C NMR (126 MHz, DMSO-d_6) δ 166.85, 159.02, 153.05, 145.90, 130.18, 119.78, 119.44, 116.12 (Figure S5). Elemental Analysis of H_2FVDC: Calculated for $C_8H_6O_5$: C, 52.80; H, 3.32 %. Found: C, 51.32; H, 3.39 %.

Synthesis of (*E*,*E*)-3,3′-(2,5-Furandiyl)bis[2-propenoic acid] (H_2FDP):



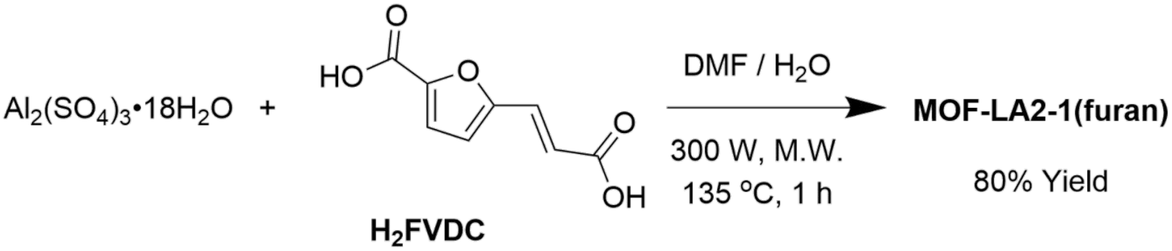
Step 1: In a 25 mL round bottomed flask with a stirrer bar and under a N_2 atmosphere, 5.031 g of malonic acid (48.35 mmol, 6 equiv.) was dissolved in 9.600 mL of *N*,*N*-Dimethylformamide. Next, 1.000 g of Furan-2,5-dicarbaldehyde (8.058 mmol, 1 equiv.) was added to the solution and stirred until it fully dissolved. Following that, 1.300 mL of pyridine (16.12 mmol, 2 equiv.) was added to the solution dropwise. The prepared solution was then heated by immersing the round-bottomed flask in a 90 ˚C oil bath with a water-cooled condenser connected on top of the flask. The reaction was left to run for 24 hours while being under a N_2 atmosphere.

Step 2: The solution was allowed to cool down to room temperature, and then was added to a 100 mL beaker with a stirrer bar. To the solution, 19.200 mL of deionized H_2O was added while stirring. Next, 2.664 mL (32.23 mmol, 4 equiv.) of 12.1 M aqueous HCl was added to the solution dropwise while stirring. The precipitate collected was then filtered.

Step 3 (optional): The obtained product was further purified using acid-base extraction. First, a solution was prepared by adding 2.855 mL of 5 M aqueous NaOH solution to 25.0 mL of deionized water in a 100 mL beaker. Second, the product obtained in **Step 2** was completely dissolved in the solution using a stirrer bar and then filtered. The filtrate then had 1.180 mL of 12.1 M aqueous HCl added to it dropwise in another 100 mL beaker, reprecipitating the product in the process. The product was then filtered and washed with 3 x 25 mL of deionized water then dried at 110 ˚C in vacuo. Yield: 1.433 g, 85%.

^{1}H NMR (500 MHz, DMSO-*d*$_6$) δ 12.48 (s, 2H), 7.38 (d, *J* = 15.7 Hz, 2H), 7.02 (s, 2H), 6.38 (d, *J* = 15.8 Hz, 2H) (Figure S2). ^{13}C NMR (126 MHz, DMSO-*d*$_6$) δ 167.18, 152.10, 129.99, 118.39, 117.56 (Figure S6). Elemental Analysis of H_2FDP: Calculated for $C_{10}H_8O_5$: C, 57.69; H, 3.88 %. Found: C, 57.40; H, 3.92 %.

Microwave synthesis of MOF-LA2-1(furan):



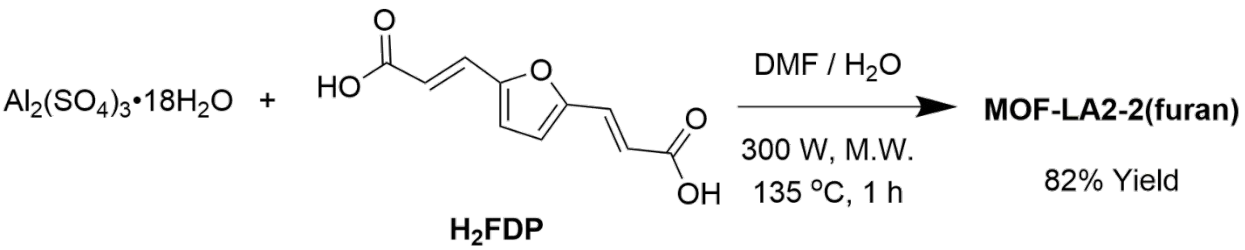
Step 1: 100 mg (0.549 mmol, 1 equiv.) of 5-formylfuran-2-carboxylic acid was added to a 35 mL microwave vessel, capped with a silicone type cap. Next, 458 µL of *N*,*N*-Dimethylformamide was added to the vessel. The mixture was vortexed until the powder is fully dissolved, forming a clear yellow solution. Following that, 730 µL of deionized water was added to the vessel and vortexed again forming a cream-white suspension until the mixture is fully homogenized. Finally, 1100 µL (0.275 mmol, 0.5 equiv.) of an aqueous 0.25 molar $Al_2(SO_4)_3 \cdot 18H_2O$ solution was added to the mixture in the vessel and vortexed again, maintaining the white homogeneous suspension.

Step 2: The vessel was securely capped and placed in the microwave reactor. The reaction was run for 1 hour, at a temperature setting of 135 ˚C, a maximum power rating of 300 W, and no stirring.

Step 3: After the reaction was complete and the vessel has cooled down to room temperature, a cream-white colored precipitate was observed at the bottom of the reaction mixture. The mixture was then transferred to a 15 mL centrifuge tube and diluted to a total volume of 15 mL using deionized water. The mixture was centrifuged at 4500 RPM for 5 minutes then the supernatant was discarded. The same procedure of dilution, centrifugation, and supernatant discarding was repeated 3 more times with 15 mL of deionized water and then 3 more times with 15 mL of methanol to wash the obtained cream-white product, discarding the supernatant after each washing step. After the last washing step with methanol the supernatant was discarded, and the solid product was dried at room temperature using a Schlenk line forming a white colored dry powder. Yield: 98 mg, 80%.

^{1}H NMR (500 MHz, D_2O) δ 6.93 (d, J = 15.9 Hz, 1H), 6.79 (d, J = 3.5 Hz, 1H), 6.50 (d, J = 3.5 Hz, 1H), 6.26 (d, J = 15.9 Hz, 1H) (Figure S3).

Microwave synthesis of MOF-LA2-2(furan):



Step 1: 100 mg (0.480 mmol, 1 equiv.) of 2,5-formylfuran was added to a 35 mL microwave vessel, capped with a silicone type cap. Next, 400 μL of *N*,*N*-Dimethylformamide was added to the vessel. The mixture was vortexed until the powder is fully dissolved, forming a clear brown solution. Following that, 639 μL of deionized water was added to the vessel and vortexed again forming a yellow suspension until the mixture is fully homogenized. Finally, 961 μL (0.240 mmol, 0.5 equiv.) of an aqueous 0.25 molar $Al_2(SO_4)_3 \cdot 18H_2O$ solution was added to the mixture in the vessel and vortexed again, maintaining the yellow homogeneous suspension.

Step 2: The vessel was securely capped and placed in the microwave reactor. The reaction was run for 1 hour, at a temperature setting of 135 ˚C, a maximum power rating of 300 W, and no stirring.

Step 3: After the reaction was complete and the vessel has cooled down to room temperature, a cream-brown colored precipitate was observed at the bottom of the reaction mixture. The mixture was then transferred to a 15 mL centrifuge tube and diluted to a total volume of 15 mL using deionized water. The mixture was centrifuged at 4500 RPM for 5 minutes then the supernatant was discarded. The same procedure of dilution, centrifugation, and supernatant discarding was repeated 3 more times with 15 mL of deionized water and then 3 more times with 15 mL of methanol to wash the obtained cream-brown product, discarding the supernatant after each washing step. After the last washing step with methanol the supernatant was discarded, and the solid product was dried at room temperature using a Schlenk line forming a light brown colored dry powder. Yield: 99 mg, 82%.

^{1}H NMR (500 MHz, D_2O) δ 6.92 (d, J = 15.9 Hz, 2H), 6.51 (s, 2H), 6.20 (d, J = 15.9 Hz, 2H) (Figure S4).

Section S3. Nuclear Magnetic Resonance (NMR)

Liquid-state ^{1}H and ^{13}C NMR spectra were collected using a Bruker NEO-500 (500 MHz). For linker sample measurements, ^{1}H signals were referenced using residual $(CH_3)_2SO$ at 2.50 ppm or H_2O at 4.79 ppm. ^{13}C signals were referenced using $(CD_3)_2SO$ at 39.52 ppm. For MOF linker compositions, samples were analyzed by digesting 10 mg of sample in 500 µL of NaOD solution (5 wt. % in D_2O) prior to NMR measurements. ^{1}H signals were referenced using residual D_2O at 4.79 ppm.

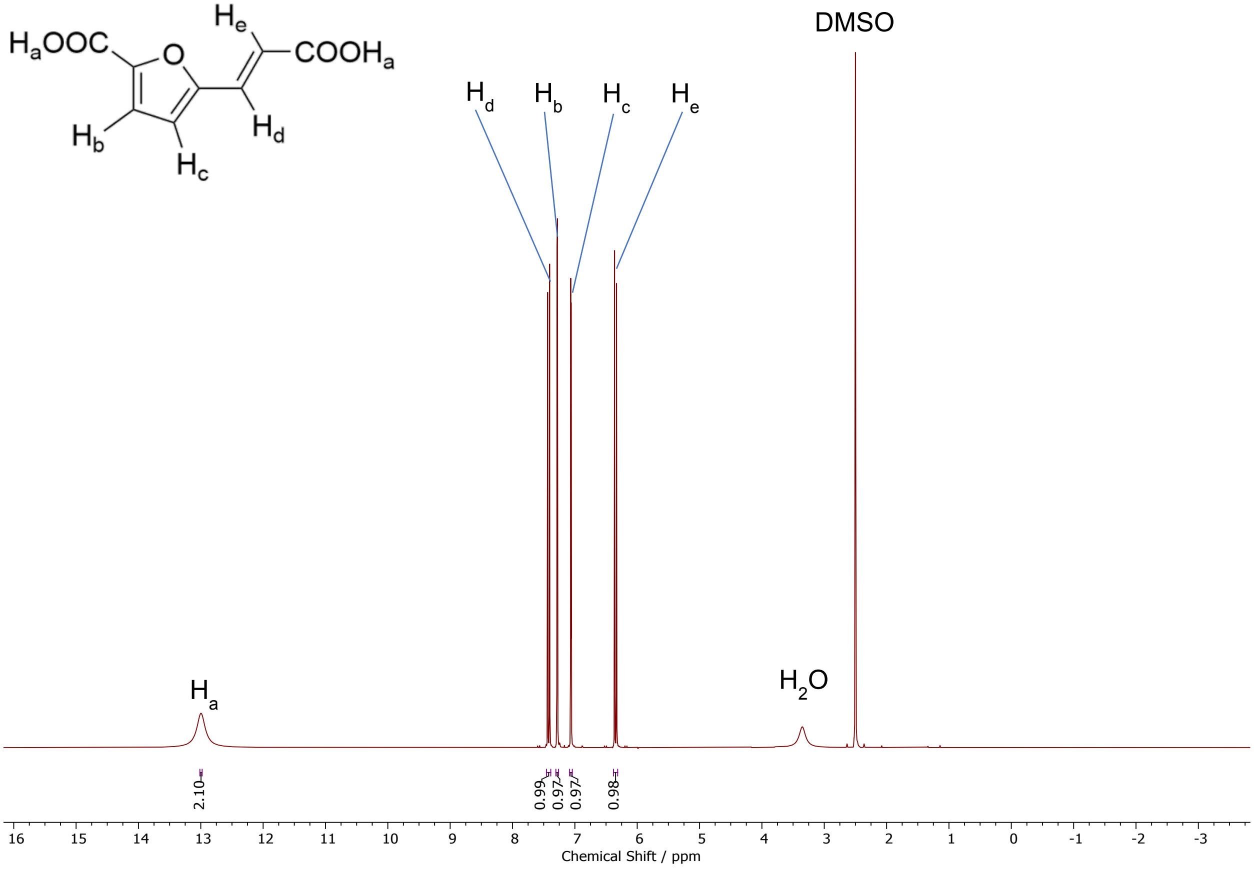


Figure S1. *^{1}H NMR spectrum of H_2FVDC linker (500 MHz, DMSO-d_6).*

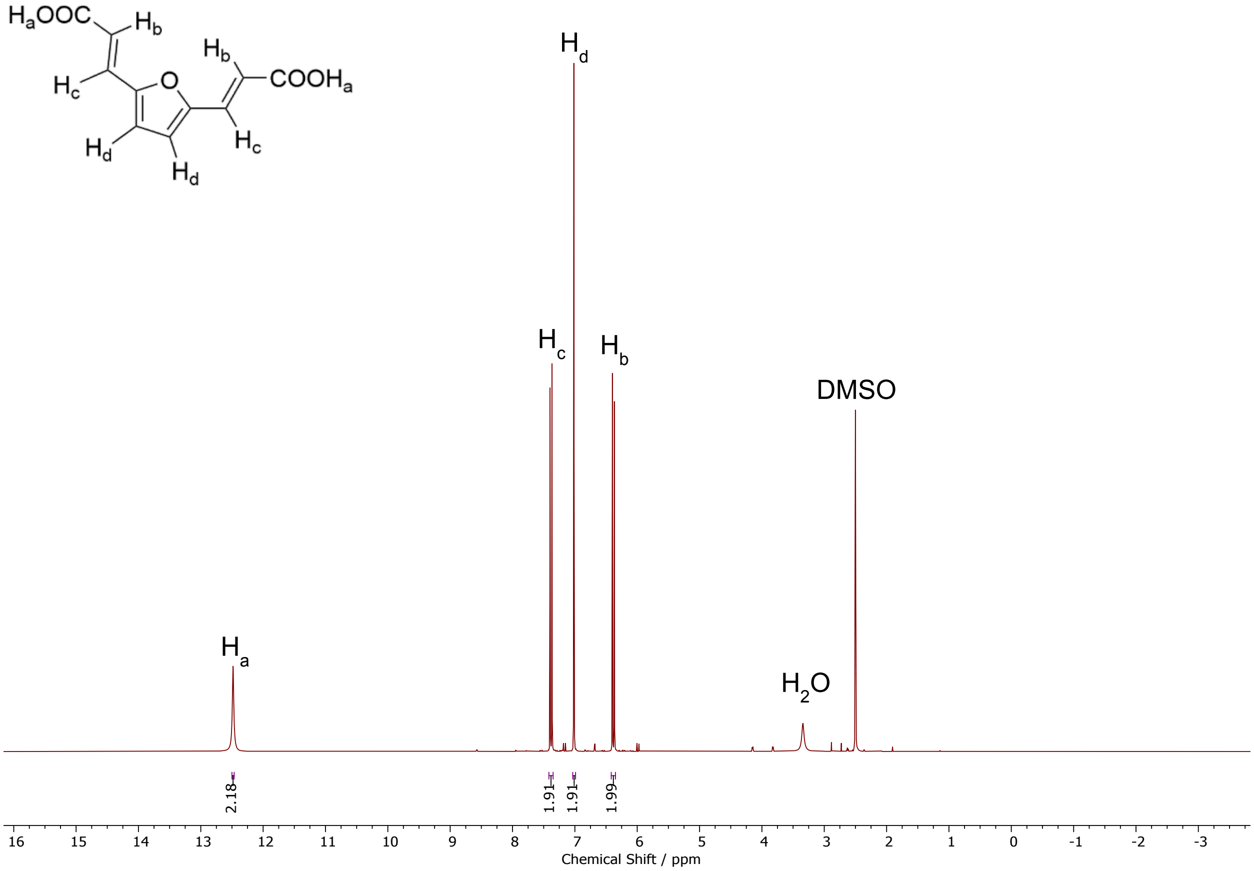


Figure S2. *^1H NMR spectrum of H_2FDP (500 MHz, DMSO-d_6).*

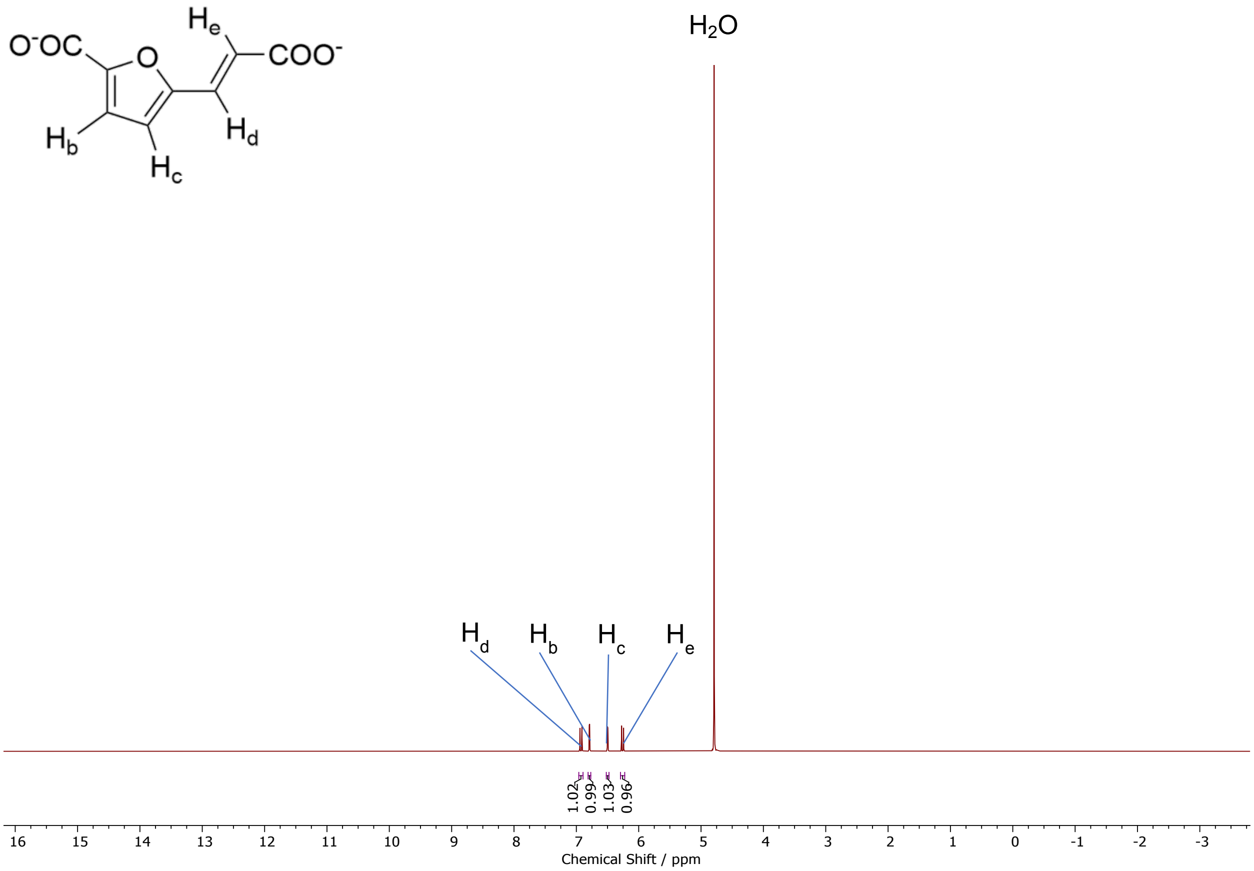


Figure S3. *^{1}H NMR spectrum of base digested MOF-LA2-1(furan) (500 MHz, D_2O).*

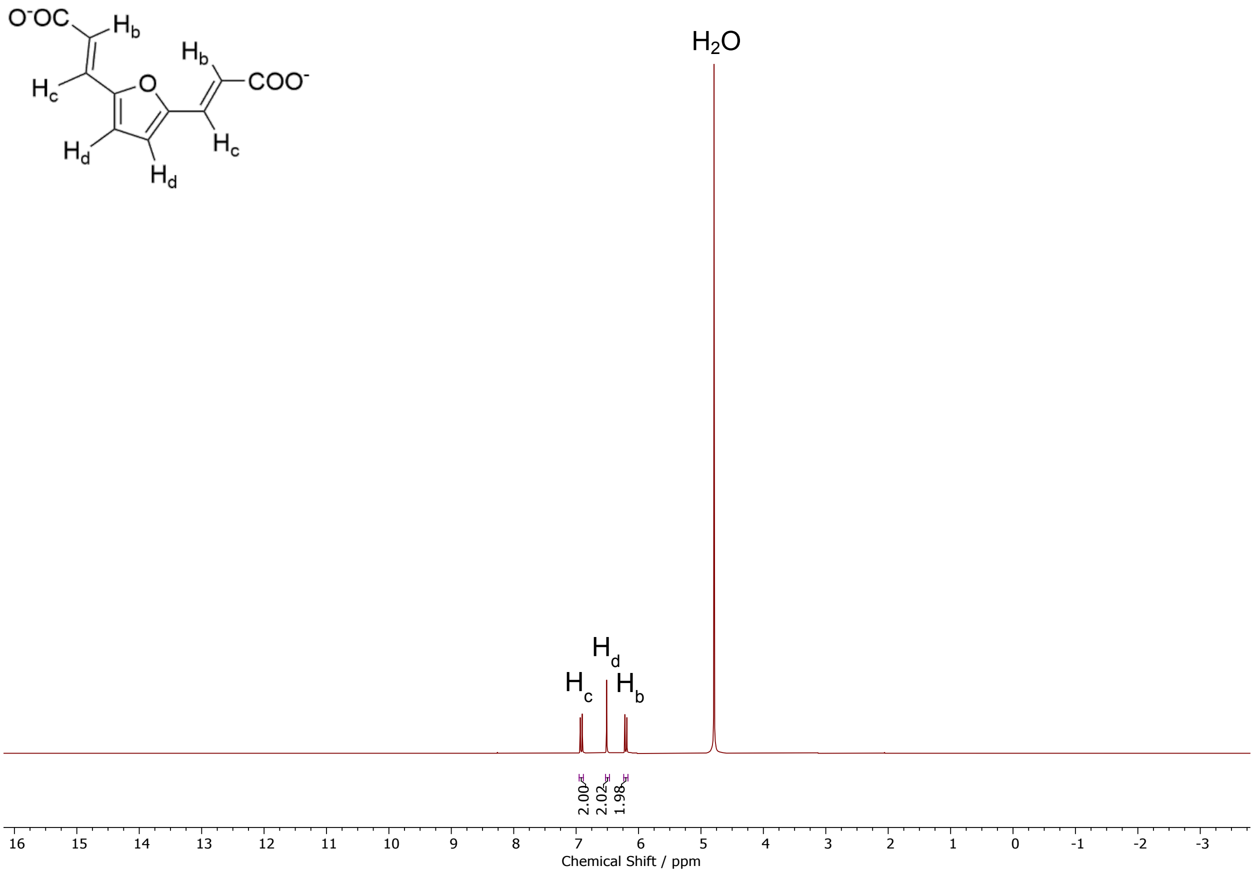


Figure S4. *^{1}H NMR spectrum of base digested MOF-LA2-2(furan) (500 MHz, D_2O).*

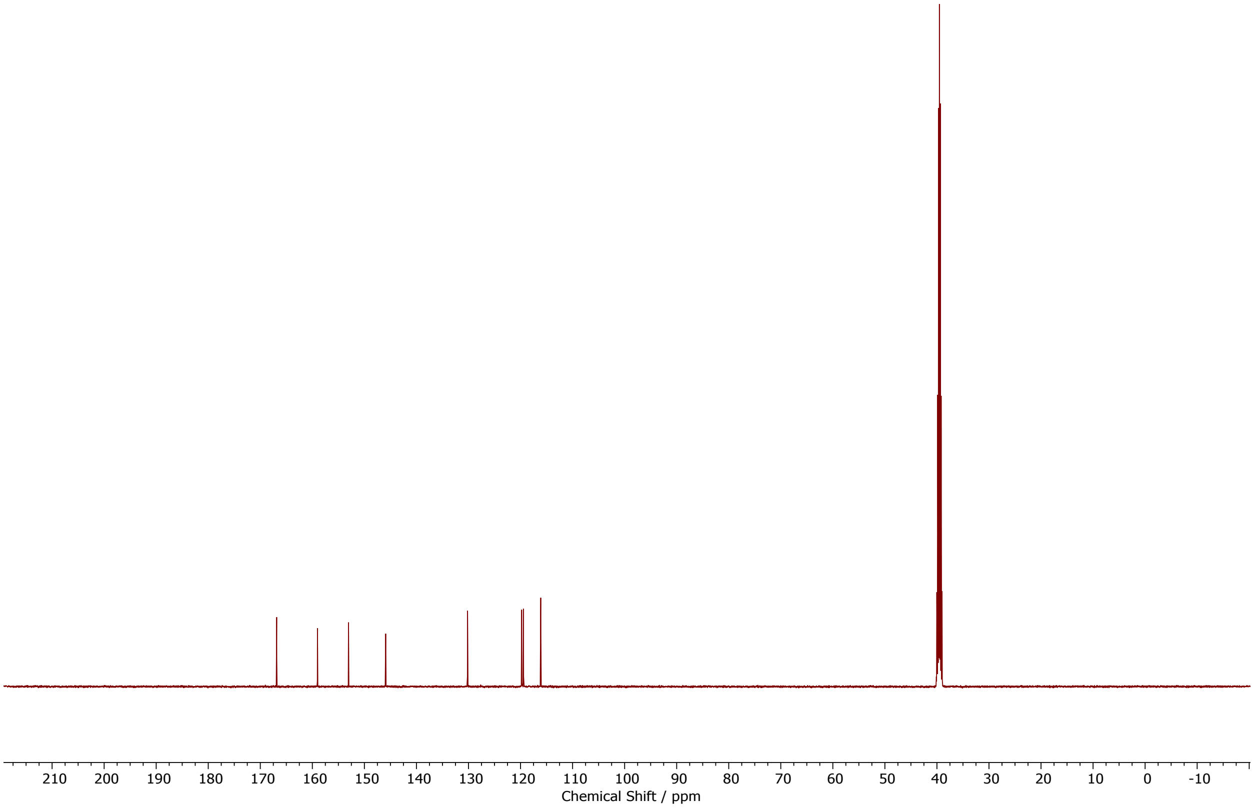


Figure S5. *^{13}C NMR spectrum of H_2FVDC linker (126 MHz, DMSO-d_6).*

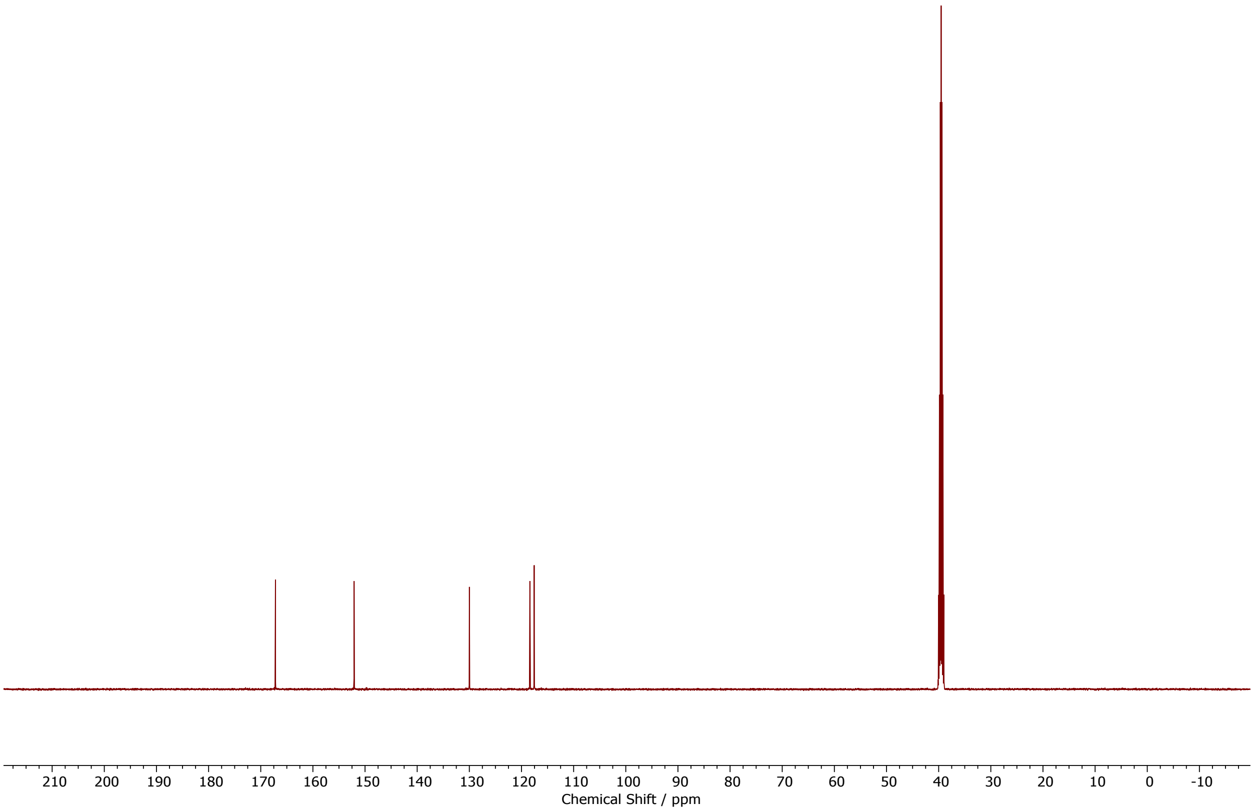


Figure S6. *^{13}C NMR spectrum of H$_2$FDP linker (126 MHz, DMSO-d$_6$).*

Section S4. Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDS)

Scanning electron microscopy (SEM) images were obtained on a Zeiss XB 550 high resolution SEM with an accelerating voltage of 1.0 kV. The samples were dispersed on conductive carbon tape, mounted on stubs, and sputter coated (Pd/Au) with a Tousimis sputter coater on top of a Bio-Rad E5400 controller. For Energy Dispersive X-Ray Spectroscopy (EDS), the Oxford X-Max EDS system was used. An accelerating voltage of 15 kV was used as well.

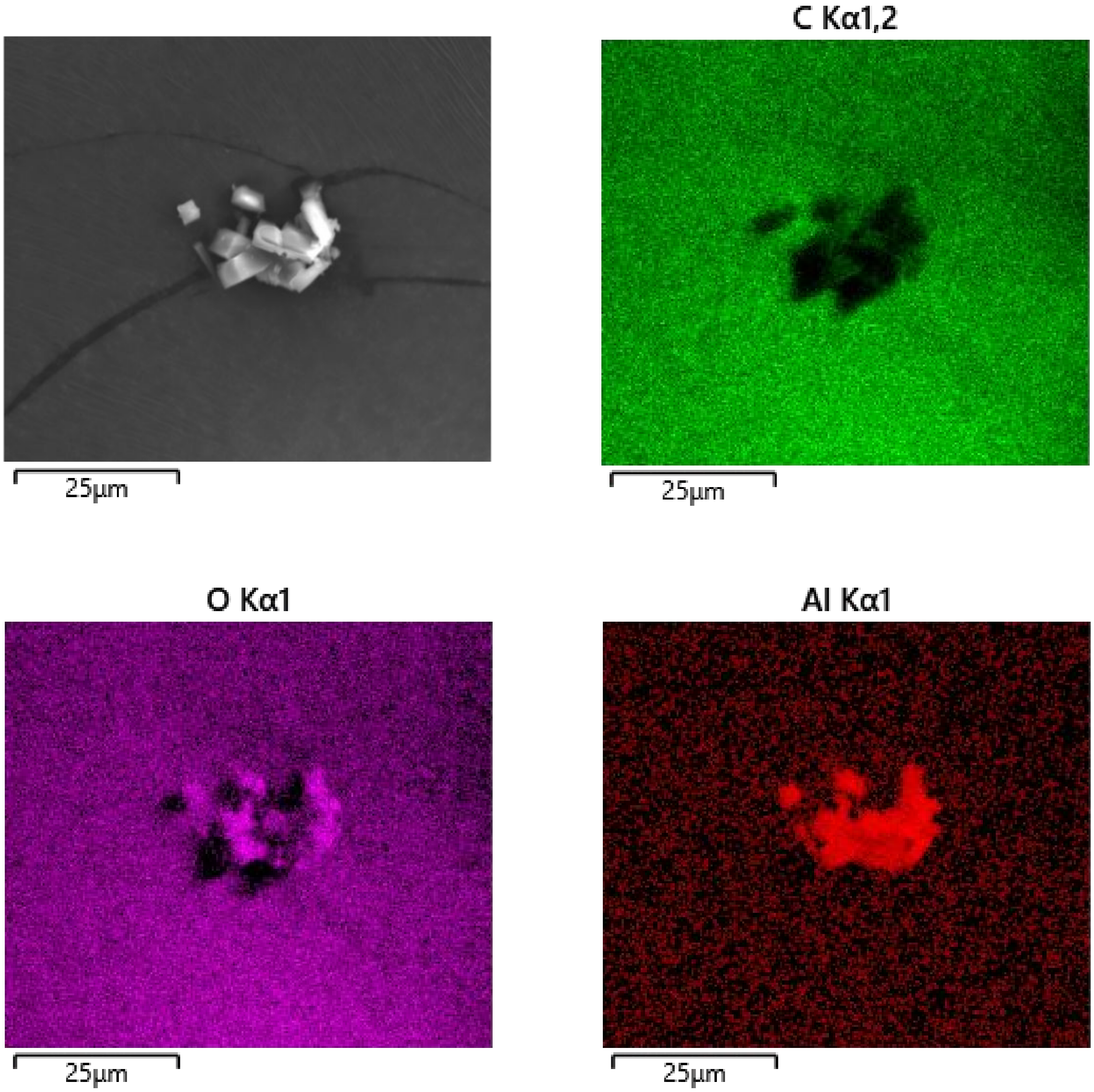


Figure S7. Scanning Electron Microscope (SEM) imagery combined with Energy Dispersive X-ray Spectroscopy (EDS) expressing the elemental composition of a MOF-LA2-1(furan) sample crystal representative of the bulk material.

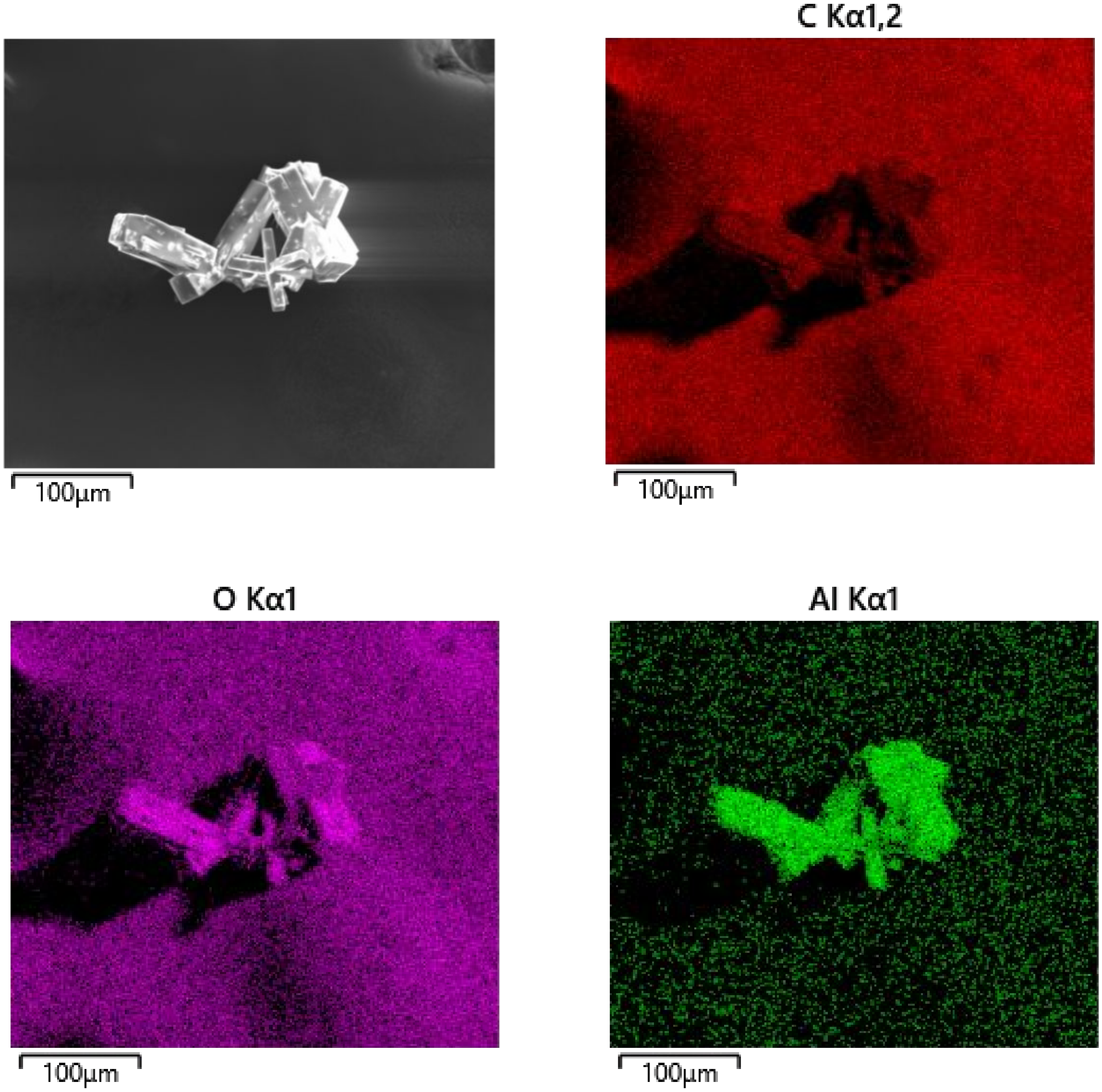


Figure S8. Scanning Electron Microscope (SEM) imagery combined with Energy Dispersive X-ray Spectroscopy (EDS) expressing the elemental composition of a MOF-LA2-2(furan) sample crystal representative of the bulk material.

Section S5. Single-Crystal X-ray Diffraction Analysis (SCXRD)

SCXRD measurements were conducted at the Advanced Light Source, Lawrence Berkeley National Laboratory, beamline 12.2.1, utilizing a wavelength of 0.7288 Å and employing combined phi and omega scans. The beamline instrumentation included a PHOTON-II CMOS detector operating in shutterless mode and a Si(111) monochromator. For the measurement, a clear rod crystal of 50 x 15 x 15 µm was mounted on a Kapton® MiTeGen MicroMount™, minimally coated with Paratone® N oil, and placed within a cold gas stream maintained at 100(2) K, generated by an Oxford Cryosystems 800 Series Cryostream.

The acquired raw data underwent processing using Bruker APEX4 software.[1] Data integration was initially performed using the SAINT program, followed by absorption correction through the SADABS program.[2,3] Structural solutions were achieved through SHELXT intrinsic phasing, and subsequent refinement was accomplished by full-matrix least squares on F^2 using SHELXL within the Olex2 software package.[4–6] The Olex2 Solvent masking procedure was applied to structures with notably disordered co-crystallized solvents.[7] Additionally, Olex2 was used for the visualization of the obtained crystal structure.[6]

Refinement details for MOF-LA2-2(furan)

The resolution of the entire dataset (PRP file) was cut off to 0.93 Å based on intensity statistics, leading to an R_{int} value of 10.93%. Anisotropic refinement was applied to all non-hydrogen atoms, and hydrogen atom positions were determined through calculations.

The MOF-LA2-2(furan) framework was accurately resolved and subjected to anisotropic refinement. Each aluminum atom exhibited a 6-coordinated environment: two μ_2-OH groups and four carboxylate groups derived from four FDP^{2-} linkers, arranged in a *trans* configuration. Notably, the carboxylate groups within the FDP^{2-} linker acted as bridging ligands, connecting to two adjacent aluminum atoms in a single rod SBU, thus allowing each FDP^{2-} linker, with two carboxylate groups, to link two rod SBUs.

During refinement, hydrogen bonding was observed between μ_2-OH and a water molecule, with the water molecule forming additional hydrogen bonds with an oxygen atom from a DMF molecule. Initially, hydrogen atoms associated with the DMF molecule's methyl groups were included in the model but were later removed due to instability during position refinement. The RIGU method was applied to stabilize the entire DMF molecule and a subset of atoms within the MOF framework. Bad Reflections that are affected by the beamstop or having $(I_{\mathrm{obs}}-I_{\mathrm{calc}})/\sigma > 10$ were omitted. Furthermore, to address inversion twinning, a twin law of [-1 0 0, 0 -1 0, 0 0 -1] was taken into consideration.

Upon convergence of the refinement process, it was observed that the goodness-of-fit (GooF) value remained notably high at 1.403. To address this, supplementary solvent masking was employed using the BYPASS method within Olex2, with default parameters set at a solvent radius of 1.2 Å and a truncation radius of 1.2 Å. As a result of the solvent masking procedure, the GooF value decreased to 1.074, accompanied by a reduction in the R_1 factor from 9.33% to 4.57%. This solvent masking unveiled a void volume of 149 $Å^3$, characterized by 36 masked electrons in accordance with the empirical chemical formula. Taking into consideration the synthetic conditions of MOF-LA2-2(furan), the remaining electron densities are attributed to unresolved water or DMF molecules residing within the void, owing to the absence of stabilization factors such as hydrogen bonding. Furthermore, the weighting scheme was refined, yielding refined parameters of a = 0.090 and b = 7.24.

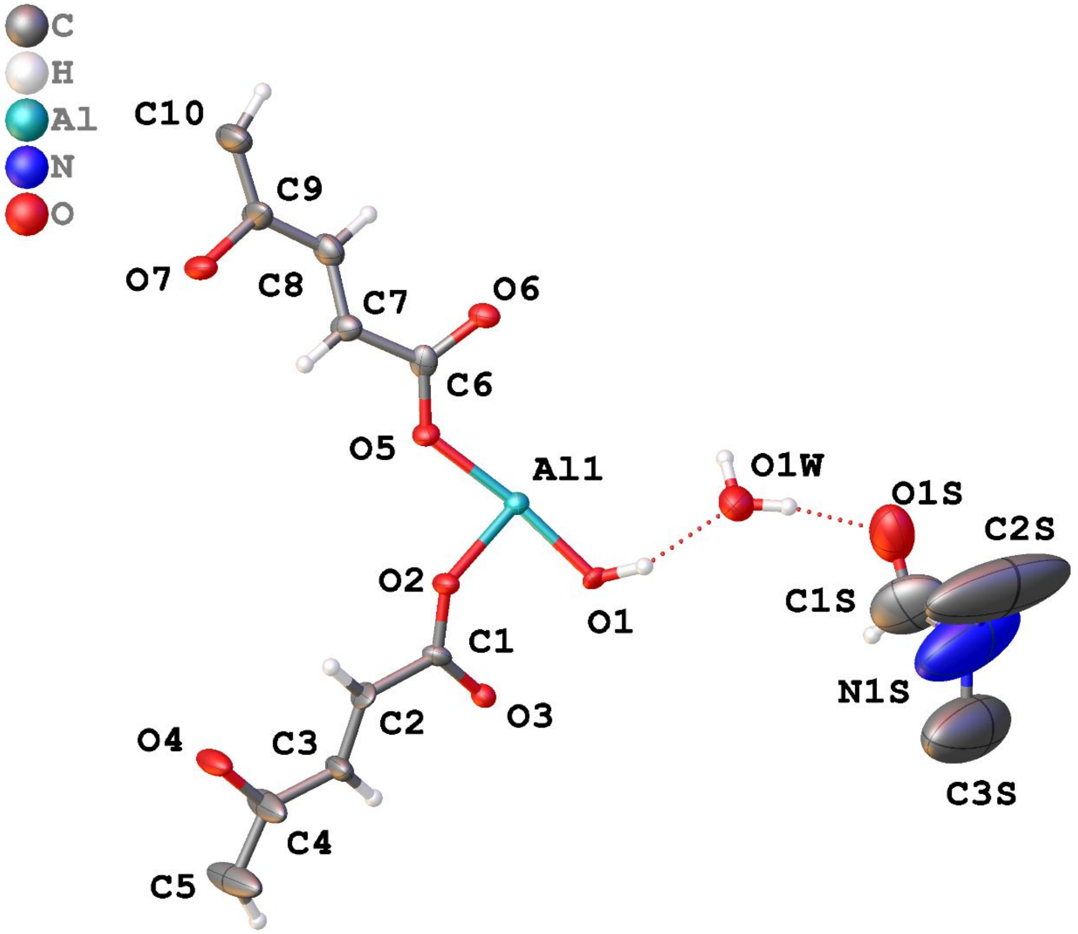


Figure S9. *Single crystal structure of MOF-LA2-2(furan). One asymmetric unit including part of the MOF framework, one water molecule and one DMF molecule is shown. Ellipsoids are plotted with 50% probability. Color code: Al, cyan; N, blue; C, grey; H, white; O, red.*

Table S1. Crystal data and structure refinement for MOF-LA2-2(furan).

	Before solvent masking	**After solvent masking**
Empirical formula	$C_{13}H_{10}AlNO_8$	$C_{13}H_{10}AlNO_8$
Formula weight	335.20	335.20
Temperature (K)	100.00	100.00
Crystal system	tetragonal	tetragonal
Space group	$I4_1md$	$I4_1md$
a **(Å)**	26.982(2)	26.982(2)
b **(Å)**	26.982(2)	26.982(2)
c **(Å)**	10.6514(12)	10.6514(12)
α **(°)**	90	90
β **(°)**	90	90
γ **(°)**	90	90
Volume (Å^3)	7754.6(14)	7754.6(14)
Z	16	16

ρ_{calc} (g/cm^3)	1.148	1.148
μ (mm^{-1})	0.145	0.145
F(000)	2752.0	2752.0
Crystal size (mm^3)	0.05 × 0.015 × 0.015	0.05 × 0.015 × 0.015
Radiation	synchrotron (λ = 0.7288)	synchrotron (λ = 0.7288)
2Θ range for data collection (°)	4.216 to 46.136	4.216 to 46.136
Index ranges	$-28 \leq h \leq 28$, $-28 \leq k \leq 28$, $-11 \leq l \leq 11$	$-28 \leq h \leq 28$, $-28 \leq k \leq 28$, $-11 \leq l \leq 11$
Reflections collected	60491	60491
Independent reflections	2646 [R_{int} = 0.1093, R_{sigma} = 0.0267]	2646 [R_{int} = 0.1093, R_{sigma} = 0.0267]
Data/restraints/parameters	2646/51/197	2646/51/197
Goodness-of-fit on F^2	1.403	1.074
Final R indexes [I>=2σ (I)]	R_1 = 0.0933, wR_2 = 0.2809	R_1 = 0.0457, wR_2 = 0.1264
Final R indexes [all data]	R_1 = 0.0966, wR_2 = 0.2869	R_1 = 0.0485, wR_2 = 0.1292
Largest diff. peak/hole / e Å^{-3}	1.34/-0.55	0.32/-0.23
Flack parameter	0.5(7)	0.5(4)

Section S6. Computational Study of MOF-LA2-1(furan) and MOF-LA2-2(furan):

Initial periodic density functional theory (DFT) calculations were performed in the *Vienna Ab Initio Simulation* software[8–10] (VASP version 6.2.1) to identify the most stable linker configurations of MOF-LA2-1(furan). A single unit cell of the MOF containing sixteen Al(μ_2-OH)(FVDC) formula units was used for the structure optimizations. The Perdew-Burke-Ernzerhof (PBE) exchange-correlation density functional[11,12] along with Grimme's D3 dispersion correction with Becke-Johnson damping[13,14] was employed. A plane-wave basis set with an energy cutoff of 520 eV was used. The structures were optimized until a convergence in the energy and forces up to 10^{-6} eV and 0.03 eV/Å was achieved. The unit cell volume and shape were relaxed along with the atomic positions of the MOF framework.

Gaussian 16, Rev. A. 03 was used for the cluster DFT calculations.[15] The M06-L[16] density functional was used. The def2-TZVP basis set was used on aluminum and the def2-SVP basis set was used on hydrogen, carbon, oxygen, and, when present, nitrogen.[17] For the examined MOFs (MOF-303, MIL-160, MOF-LA2-1(pyrazole), and MOF-LA2-1-furan), the cluster models consisted of three dicarboxylate linkers connecting parallel segments of aluminum rods. Each segment consisted of six aluminum-based octahedra and seven truncated formate molecules. The formate carbon atoms were frozen in position to model the rigidity of the MOF framework. To obtain charge neutral models, hydroxyl and aqua ligands on the terminating Al octahedra. The MOF-LA2-1(pyrazole) model was cut from its lowest energy published theoretical structure.[18] All models were optimized both as a dry framework model and as a hydrated framework model with one water molecule displacing an Al-O(linker) bond.

The energy penalty for linker displacement by a water molecule was estimated as electronic energy difference according to the following equation:

$$\Delta E = E_{MOF \cdot H_2O} - E_{MOF} - E_{H_2O}$$

For MIL-160 and MOF-LA2-1(furan), the linker hydrolysis penalty was found to be 5.3 kcal/mol and 3.4 kcal/mol, respectively while for MOF-303 and MOF-LA2-1(pyrazole), this hydrolysis penalty was computed as 8.4 kcal/mol and 2.8 kcal/mol respectively.

Table S2. Relative stability (kJ/mol) per asymmetric unit of different linker configurations of MOF-LA2-1(furan) optimized using periodic density functional theory.

Linker configuration	Absolute energy (eV)	Relative stability (kJ/mol)
ENT-*trans*	−2250.074828	34.6
ENT-*cis*	−2255.815060	0.0
ZUS-*trans*	−2248.025433	47.0
ZUS-*cis*	−2252.872055	17.7

Table S3. Absolute energies of cluster models (Hartree)

Structure	***E***	**Δ*E***
	Hartree	**kcal/mol**

Isolated water	-76.350532	-
MIL-160	-9121.877885	5.3
MOF-LA2-1(furan)	-9353.910529	3.4
MOF-303	-9110.444250	8.4
MOF-LA2-1(pyrazole)	-9342.477977	2.8

Section S7. Powder X-ray Diffraction Analysis (PXRD)

Powder X-Ray Diffraction (PXRD) analysis measurements were performed using the Bruker D8 Advance X-ray diffractometer equipped with a Cu anode and a Ni filter (CuKα_1, λ = 1.54059 Å) in Bragg-Brentano geometry. The samples were mounted on a zero-background holder and leveled using a glass slide. The PXRD patterns were collected in the range between 3.00° and 50.00° with 2303 steps (0.02° per step) with an acquisition time of 10 seconds per step, thus resulting in ~6.5 hours analysis time.

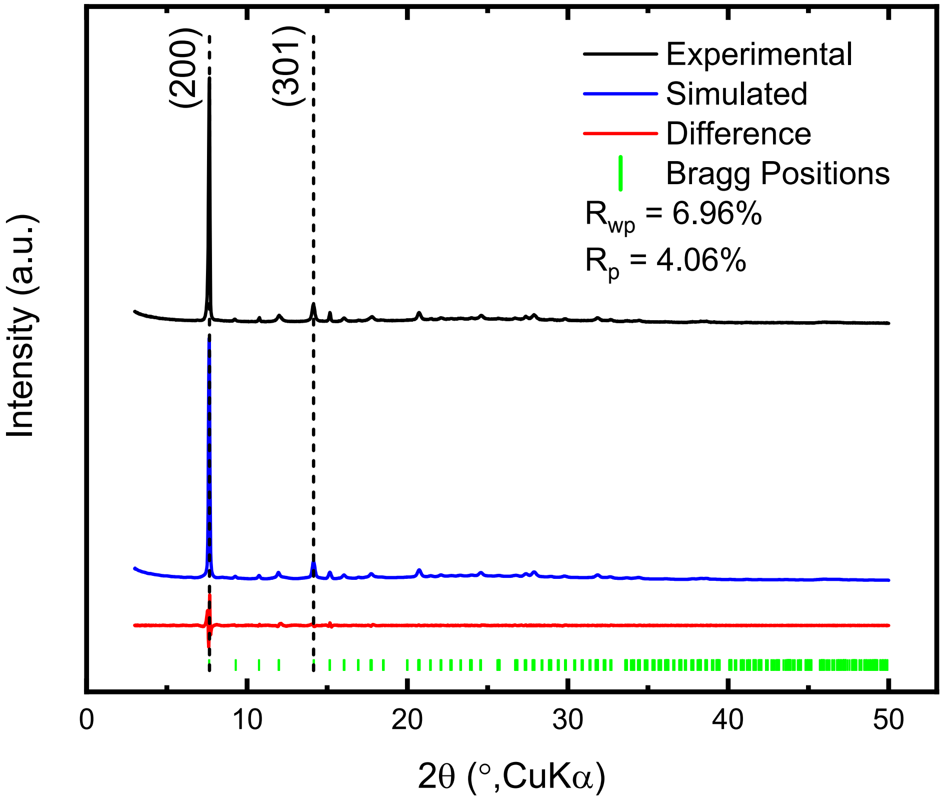


Figure S10. Pawley refinement of the theoretically determined MOF-LA2-1(furan) structure against the experimentally obtained pattern of MOF-LA2-1(furan).

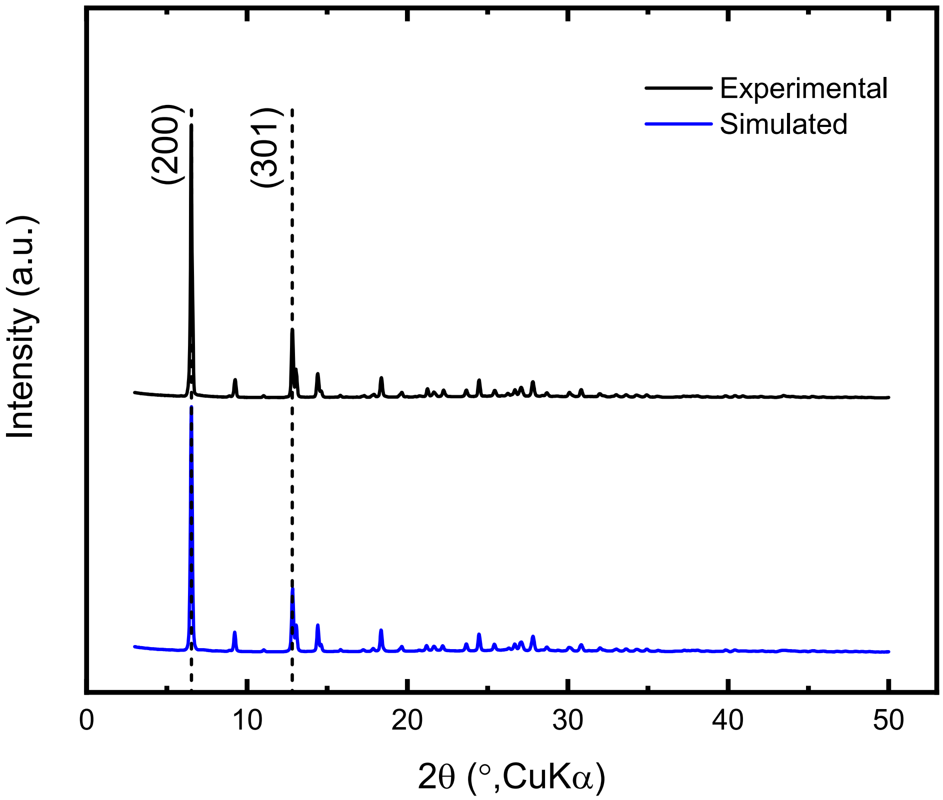


Figure S11. *PXRD pattern of the bulk MOF-LA2-2(furan) powder compared to its simulated pattern.*

Section S8. Nitrogen Sorption Analysis

Nitrogen sorption measurements were performed using the Micromeritics ASAP 2420 surface area analyzer. Nitrogen isotherms were measured by immersing sample cells in a liquid Nitrogen bath (77 K) throughout the measurement. Helium gas was used to correct for dead volume.

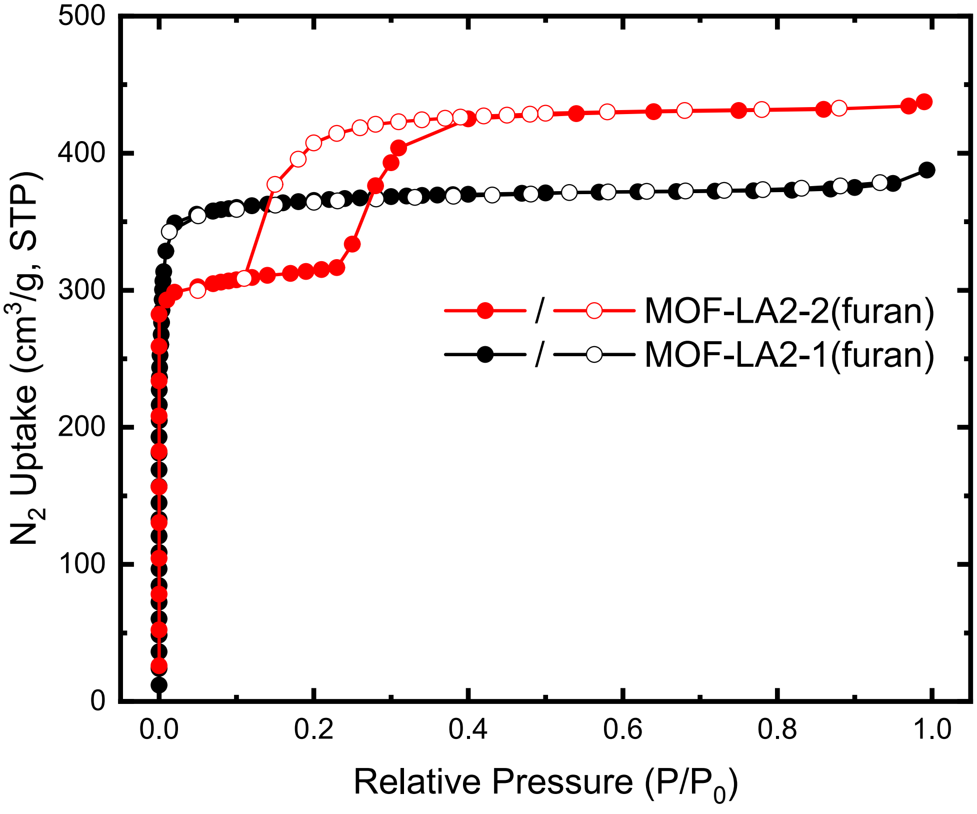


Figure S12. *Nitrogen Sorption Analysis of MOF-LA2-1(furan) and MOF-LA2-2(furan) at 77 K. P, nitrogen pressure;* P_0 *= 1 atm; STP, standard temperature and pressure.*

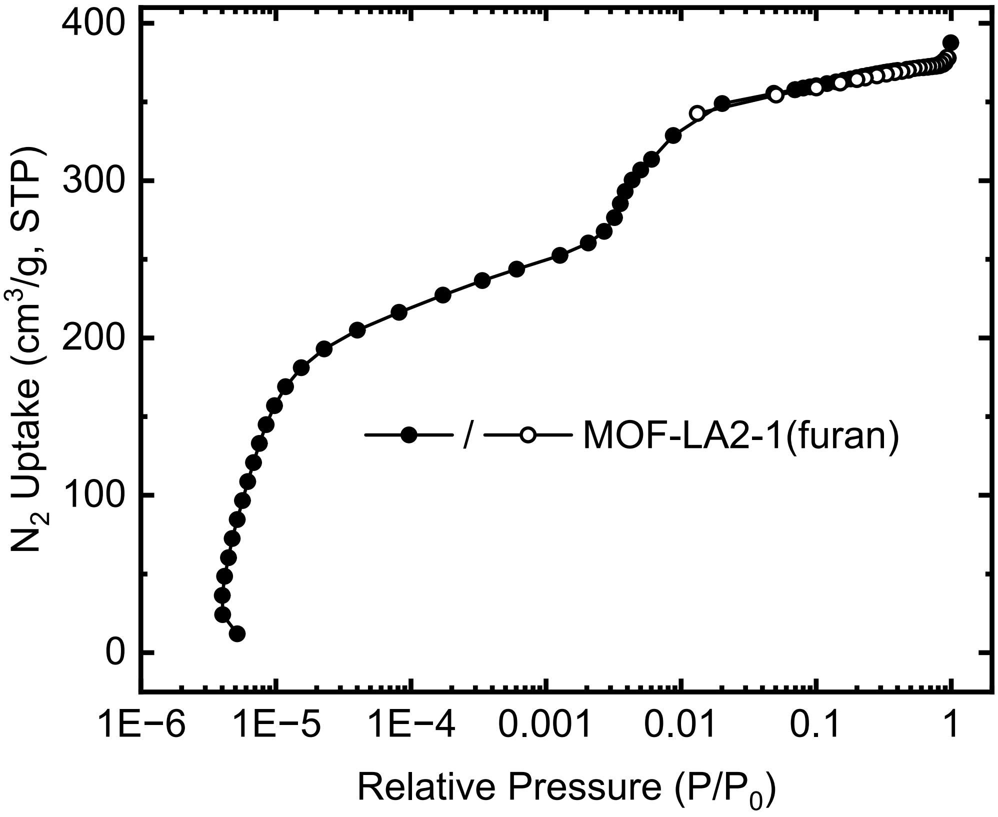


Figure S13. *Nitrogen Sorption Analysis of MOF-LA2-1(furan) with a logarithmic scale for the x-axis at 77 K. P, nitrogen pressure;* P_0 *= 1 atm; STP, standard temperature and pressure.*

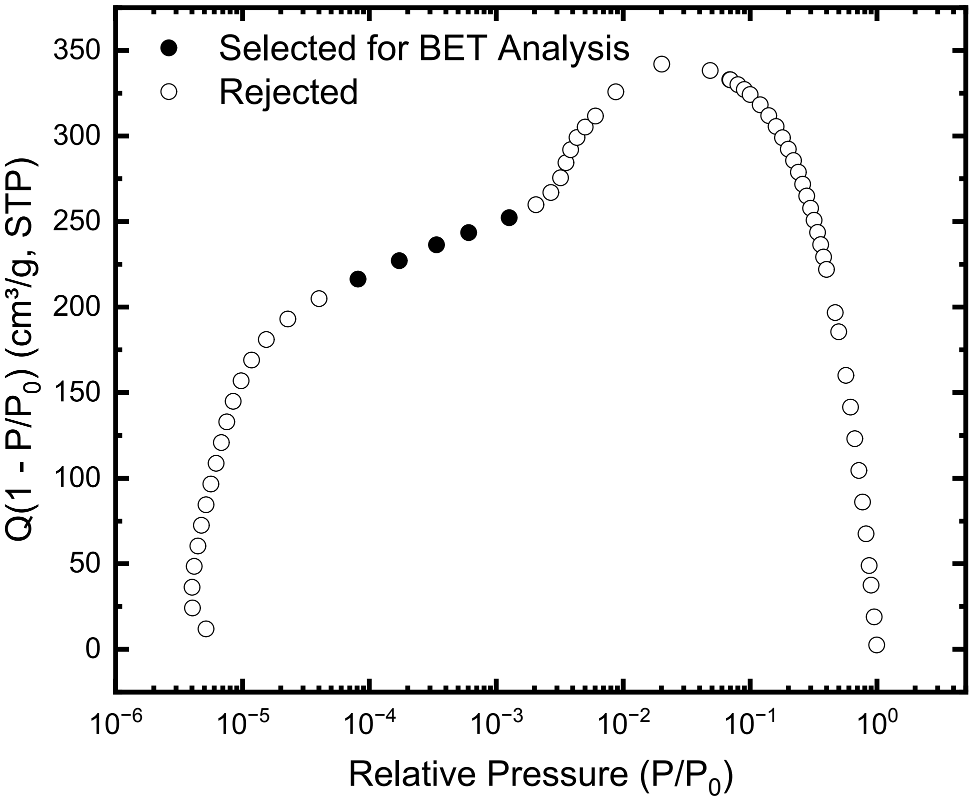


Figure S14. *Rouquerol plot of Al-LA2-1(furan) to determine appropriate points for BET analysis.*

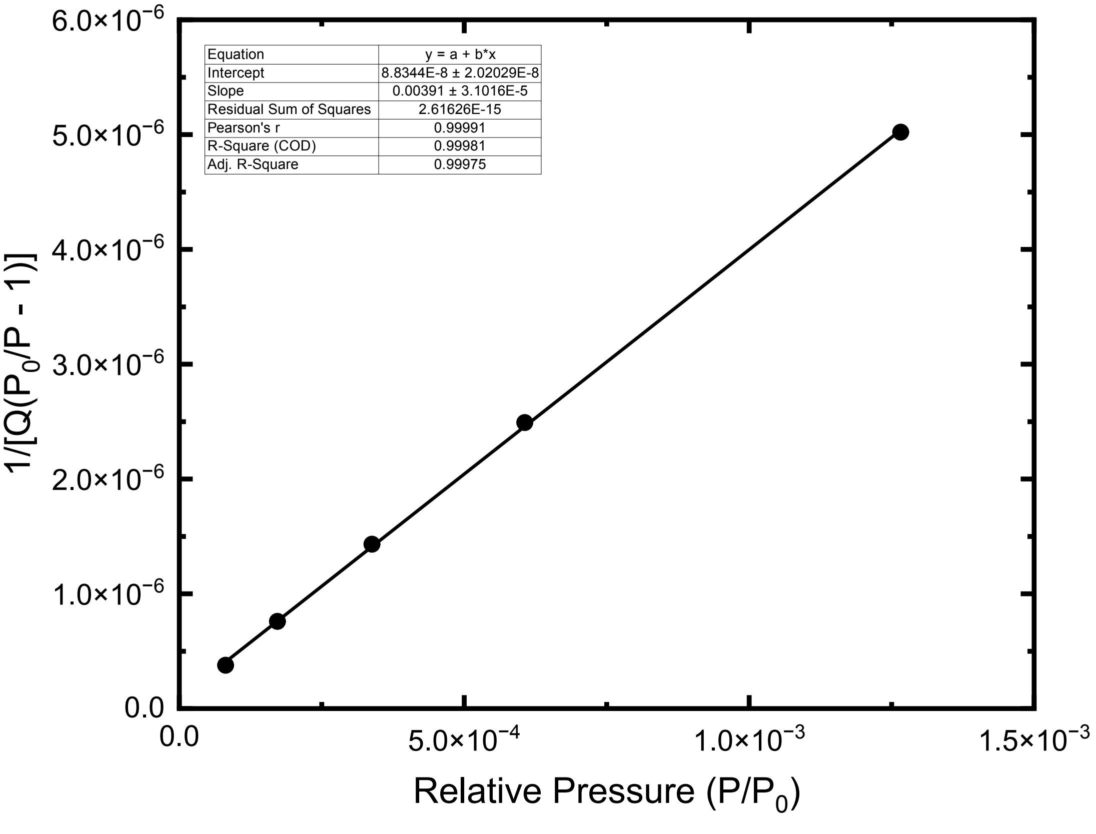


Figure S15. *BET plot of MOF-LA2-1(furan) resulting in a BET area of 1,113 m²/g.*

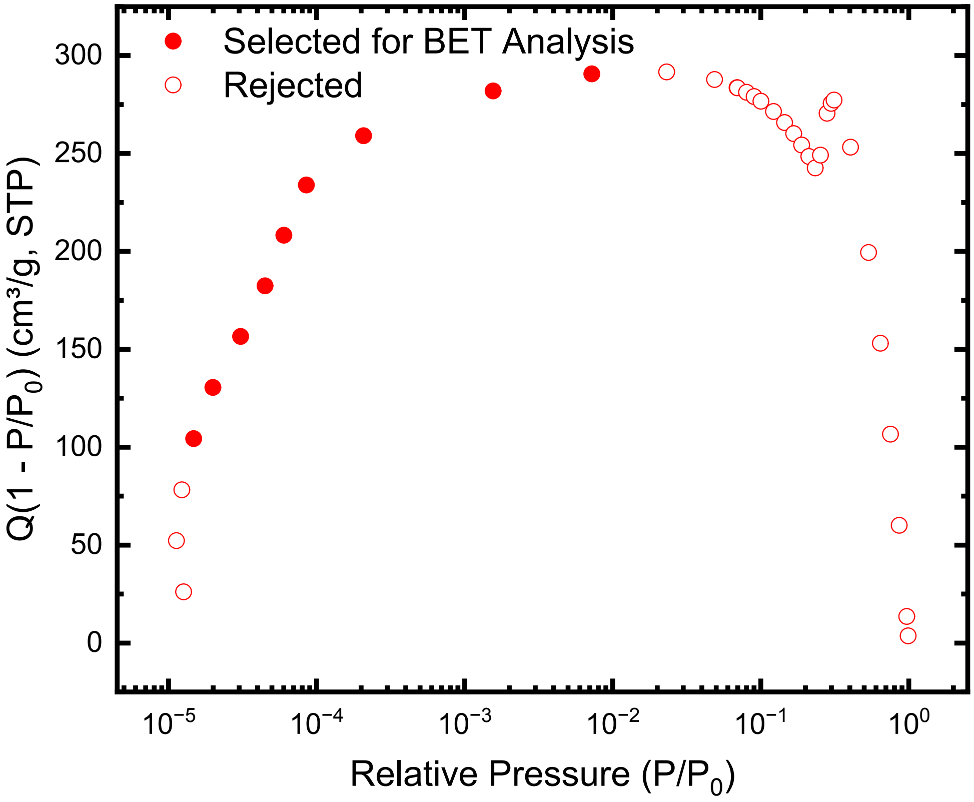
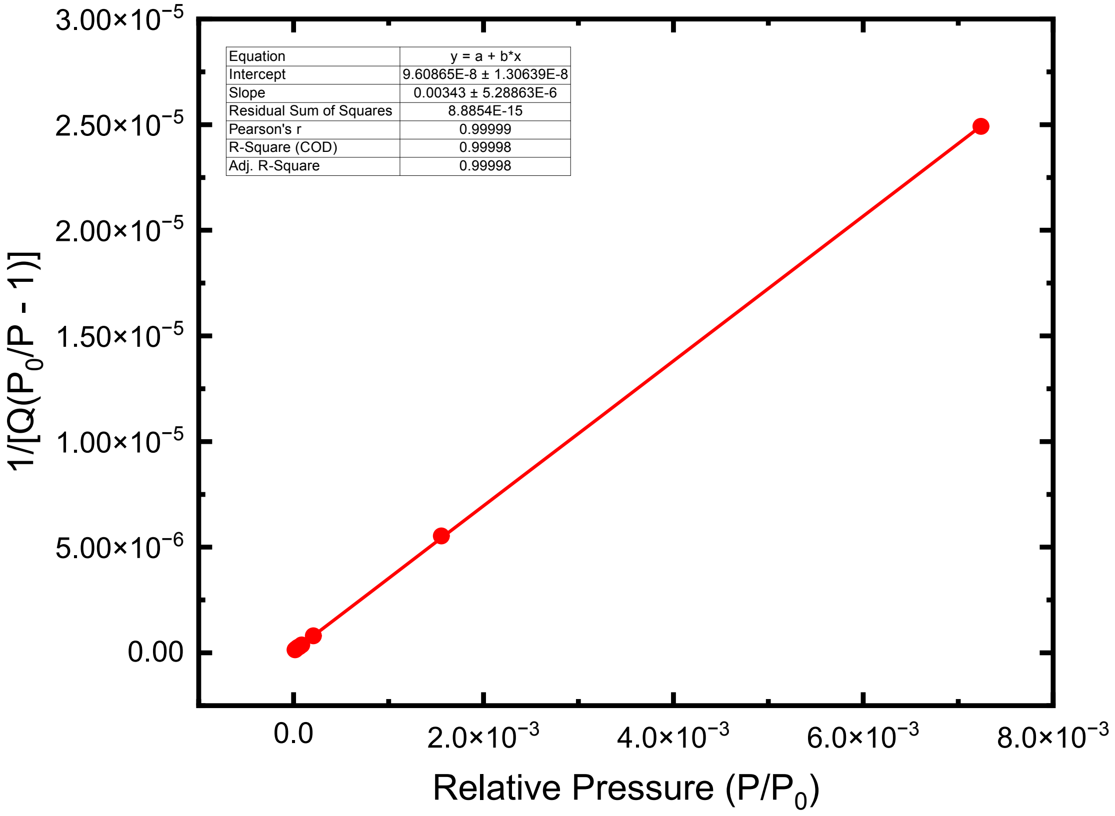


Figure S16. *Rouquerol plot of Al-LA2-2(furan) to determine appropriate points for BET analysis.*



Equation	y = a + b*x
Intercept	9.60865E-8 ± 1.30639E-8
Slope	0.00343 ± 5.28863E-6
Residual Sum of Squares	8.8854E-15
Pearson's r	0.99999
R-Square (COD)	0.99998
Adj. R-Square	0.99998

Figure S17. *BET plot of MOF-LA2-2(furan) resulting in a BET area of 1,269 m²/g.*

Section S9. Water Sorption Analysis

Isothermal water vapor measurements were performed using the Belsorp MAX II high precision gas/vapor adsorption measurement instrument. The vapor source containing deionized water was degassed prior to measurements using 3 cycles of freeze-pump-thaw. The temperature of each respective measurement was maintained by immersing sample cells in an isothermal water bath throughout the measurement. Helium gas was used to correct for dead volume.

Isobaric water vapor measurements were performed using the TA Instruments SDT Q600 Thermogravimetric Analyzer & Differential Scanning Calorimeter. The temperature and relative humidity were monitored using a thermocouple and a humidity sensor positioned downstream of the TGA chamber. To introduce humidity into the TGA chamber, nitrogen gas flowed through a water bubbler apparatus upstream of the TGA chamber. Hence by controlling the ratio of flow rates between the humidified nitrogen feed and another separate dry nitrogen feed, the water vapor partial pressure of the chamber can be controlled. The two gas flows were mixed and fed into the chamber with a total flow rate sum of 200 mL/min and the ratio of the two flow rates were calibrated to maintain the required water vapor partial pressure.

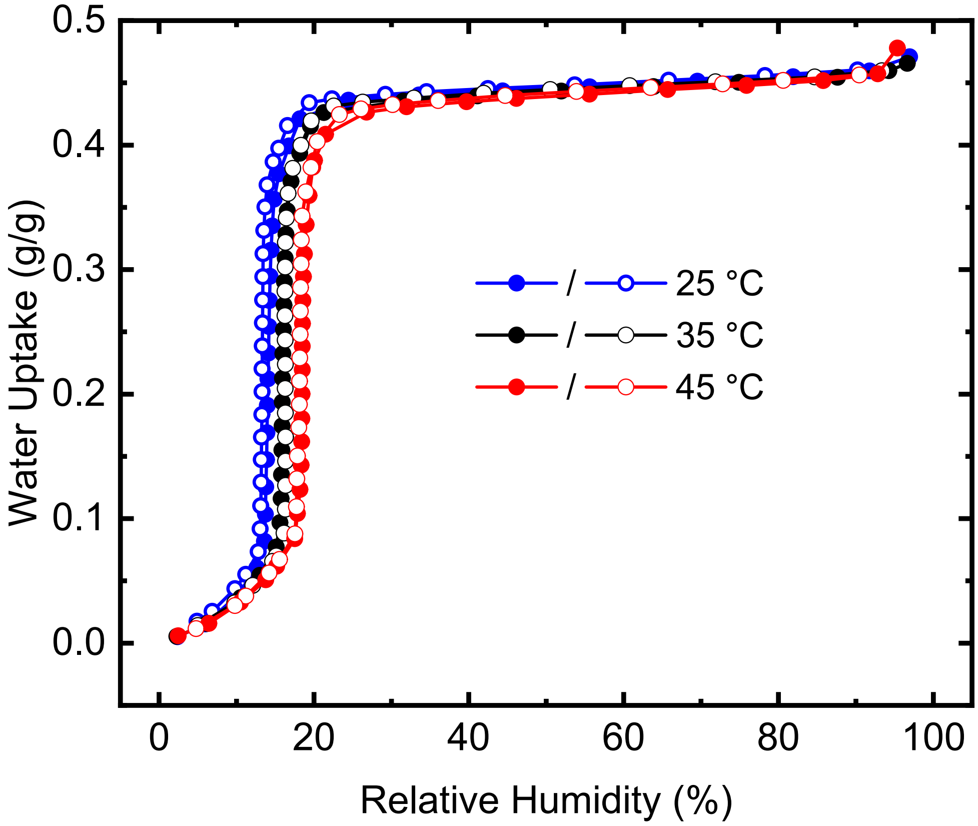


Figure S18. Isothermal water sorption analysis for MOF-LA2-1(furan) at 25 °C, 35 °C, and 45 °C.

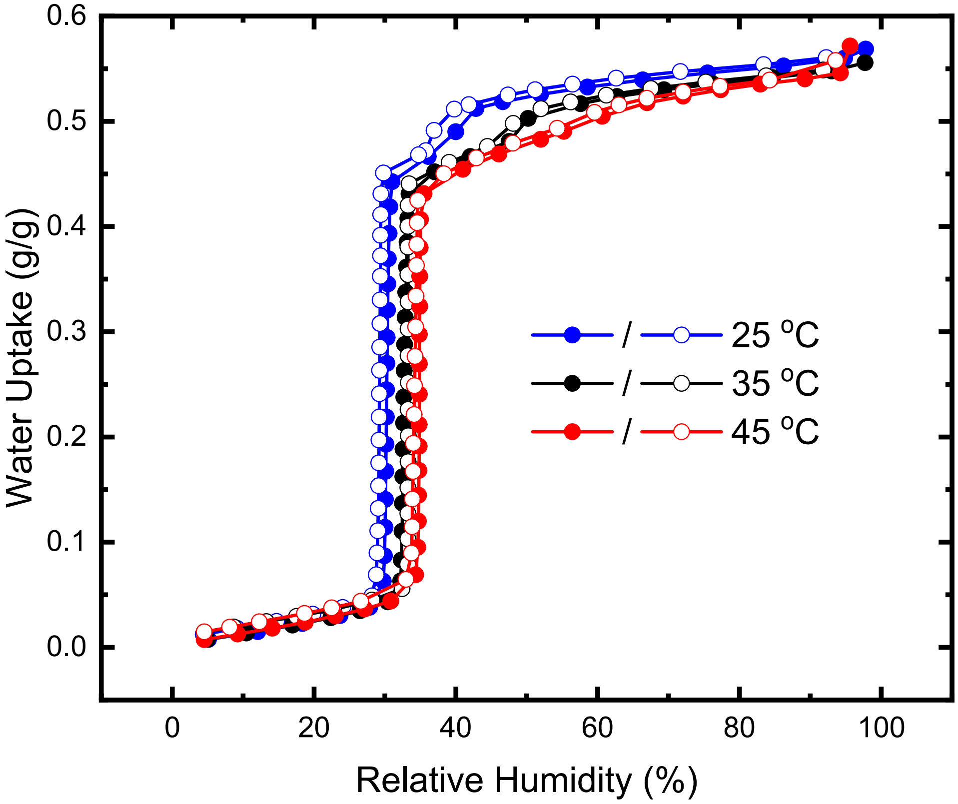


Figure S19. Isothermal water sorption analysis for MOF-LA2-2(furan) at 25 ˚C, 35 ˚C, and 45 ˚C.

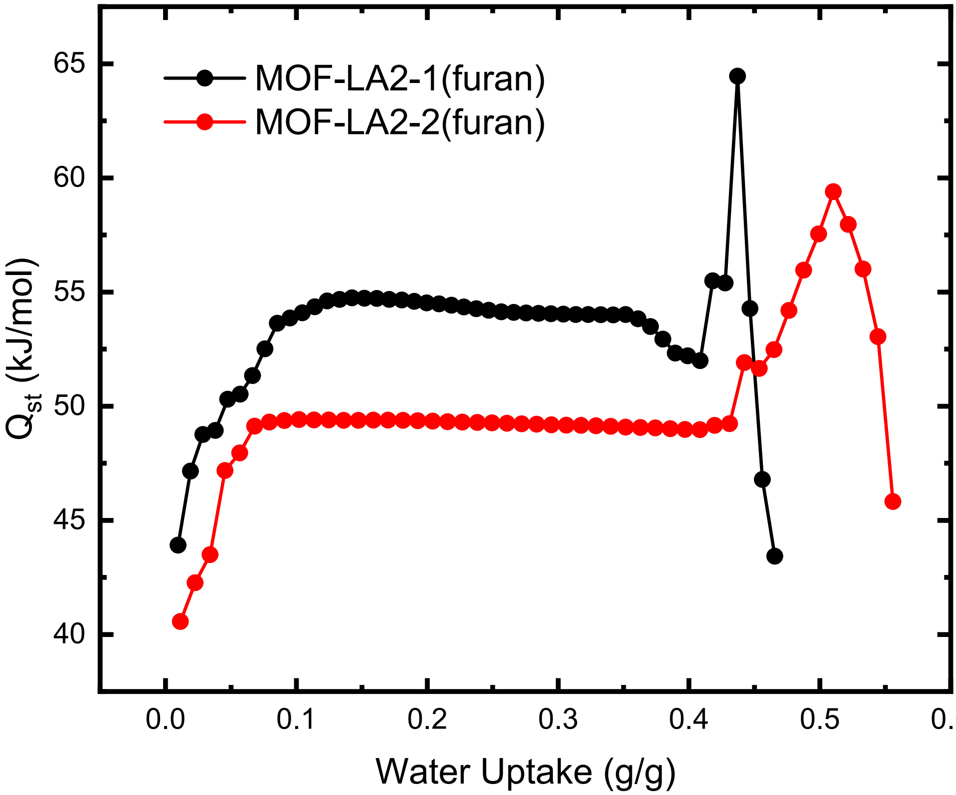


Figure S20. *The isosteric heat of adsorption (Q_{st}) of MOF-LA2-1(furan) and MOF-LA2-2(furan) plotted as a function of uptake determined using the Clausius-Clapeyron equation.*

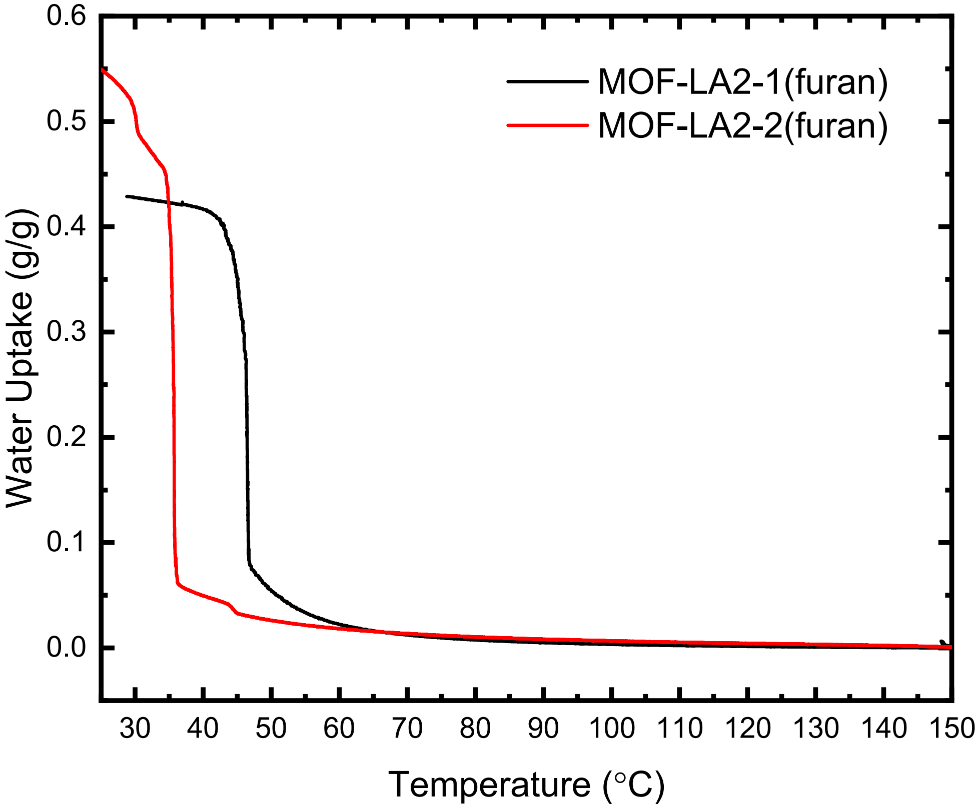


Figure S21. *Isobaric Water Desorption Analysis for MOF-LA2-1(furan) and MOF-LA2-2(furan) at a Water Vapor Pressure of 1.70 kPa.*

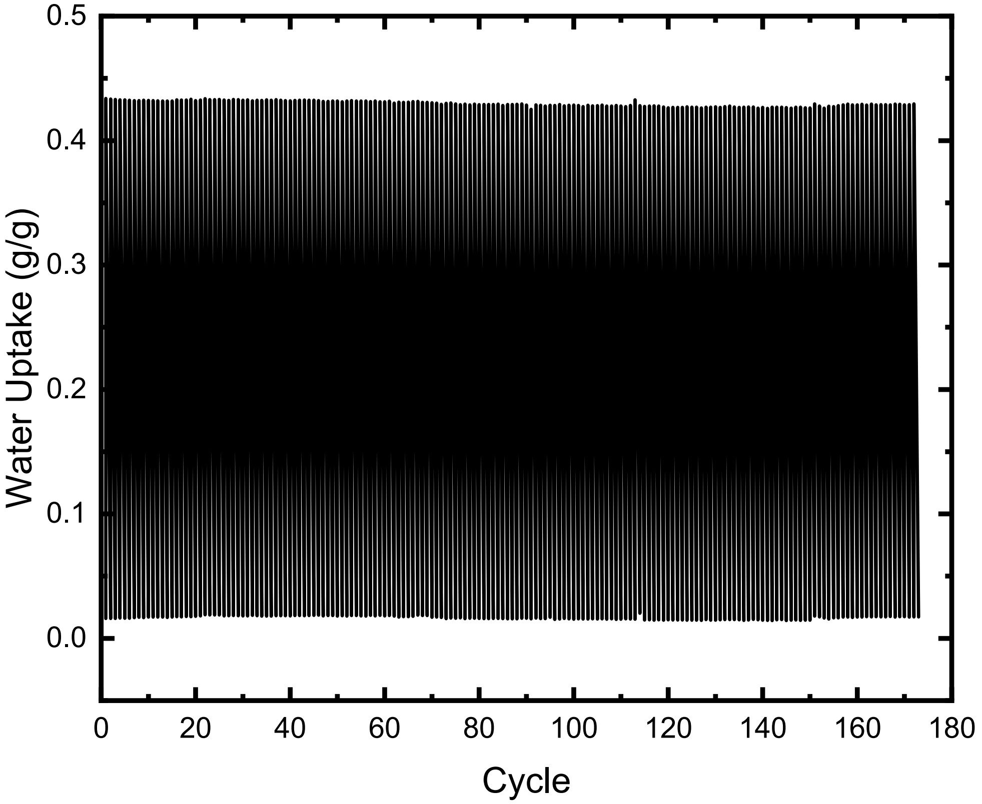


Figure S22. *Isobaric cyclic water sorption measurements performed for MOF-LA2-1(furan) for 173 cycles at a water vapor pressure of 1.70 kPa. A temperature swing mode was used between 30 °C (adsorption) and 65 °C (desorption).*

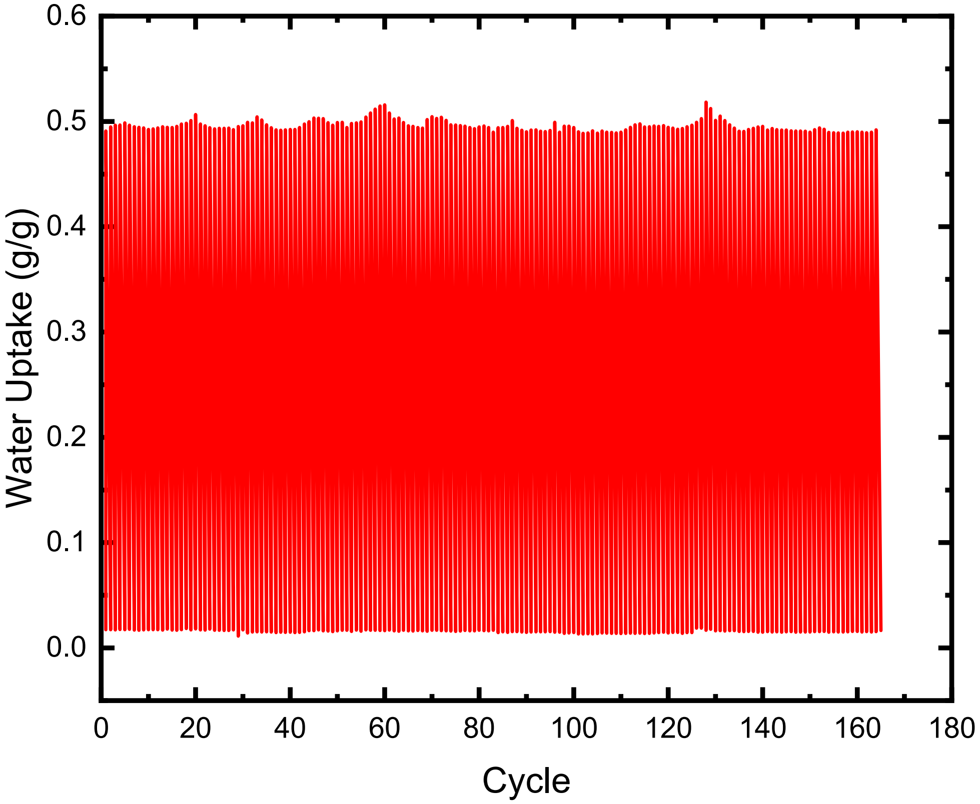


Figure S23. *Isobaric cyclic water sorption measurements performed for MOF-LA2-2(furan) for 165 cycles at a water vapor pressure of 1.70 kPa. A temperature swing mode was used between 30 °C (adsorption) and 50 °C (desorption).*

Section S10. References

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