Supplementary Information For

"A Comparison of the Structural Collapse of Zeolitic Imidazolate Frameworks (ZIFs) and Aluminosilicate Zeolites by Ball-milling"

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Powder X-ray Diffraction Data

All powder X-ray diffraction data was collected on a Bruker-AXS D8 diffractometer from a 2θ range 5-60° in Bragg-Brentano parafocusing geometry using a LynxEye position sensitive detector and radiation of (Cu Kα)1 (λ =1.540598 Å). The program X'pert HighScore Plus was used to analyse the resulting data.

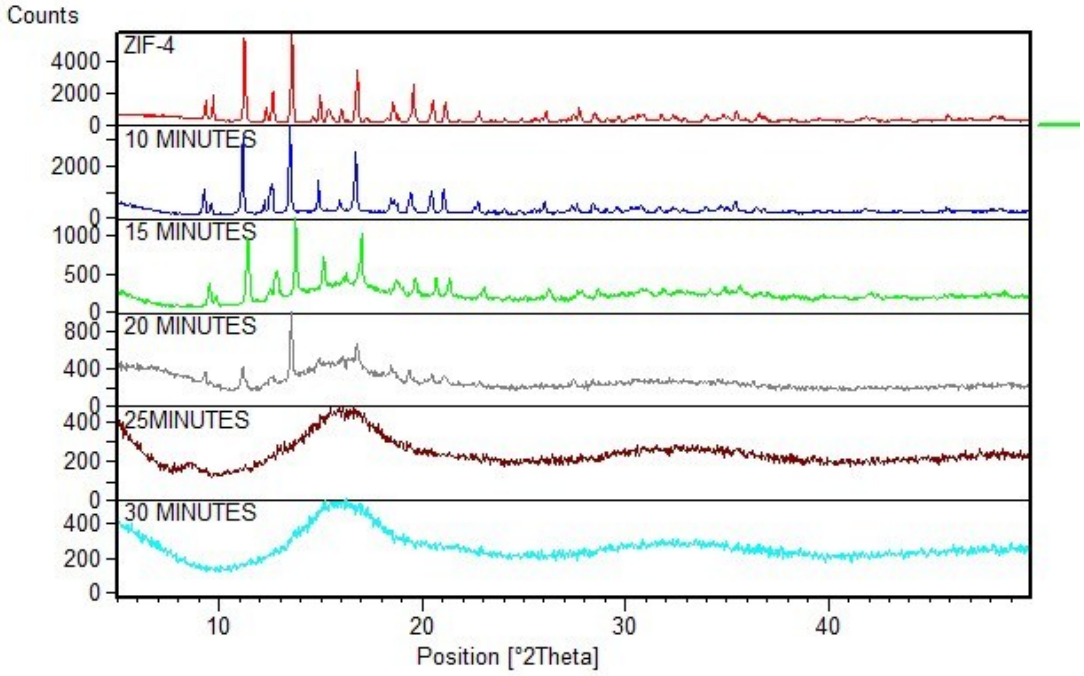

Fig. S1 PXRD of crystalline ZIF-4 ball milled at various times.

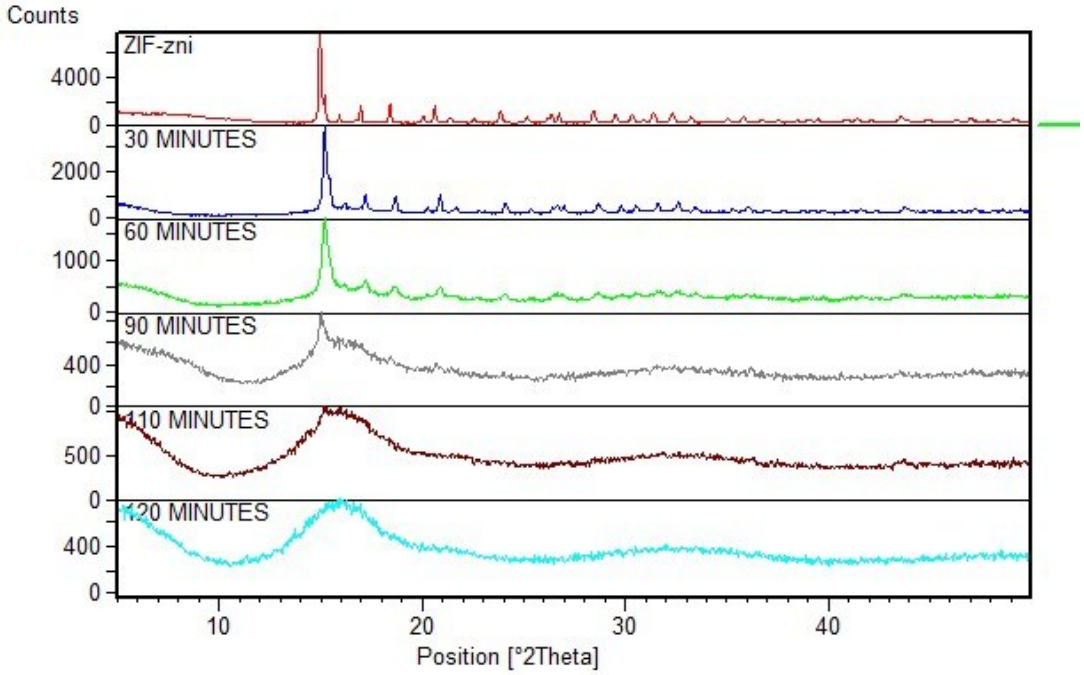

Fig. S2 PXRD of crystalline ZIF-zni ball milled at various times.

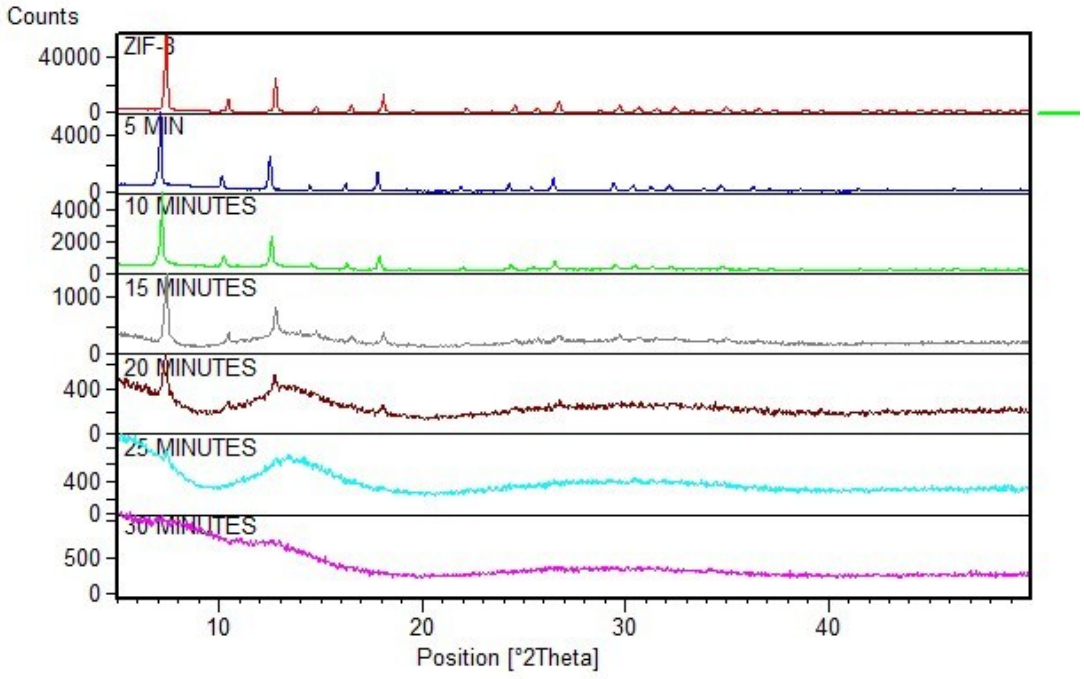

Fig. S3 PXRD of crystalline ZIF-8 ball milled at various times.

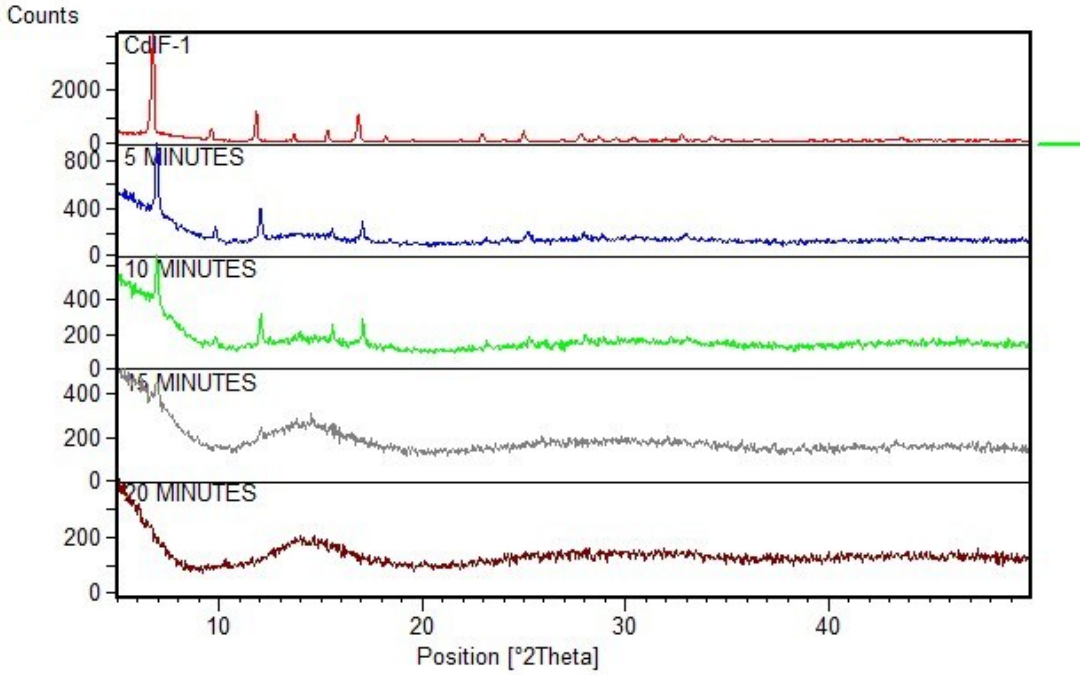

Fig. S4 PXRD of crystalline CdIF-1 ball milled at various times.

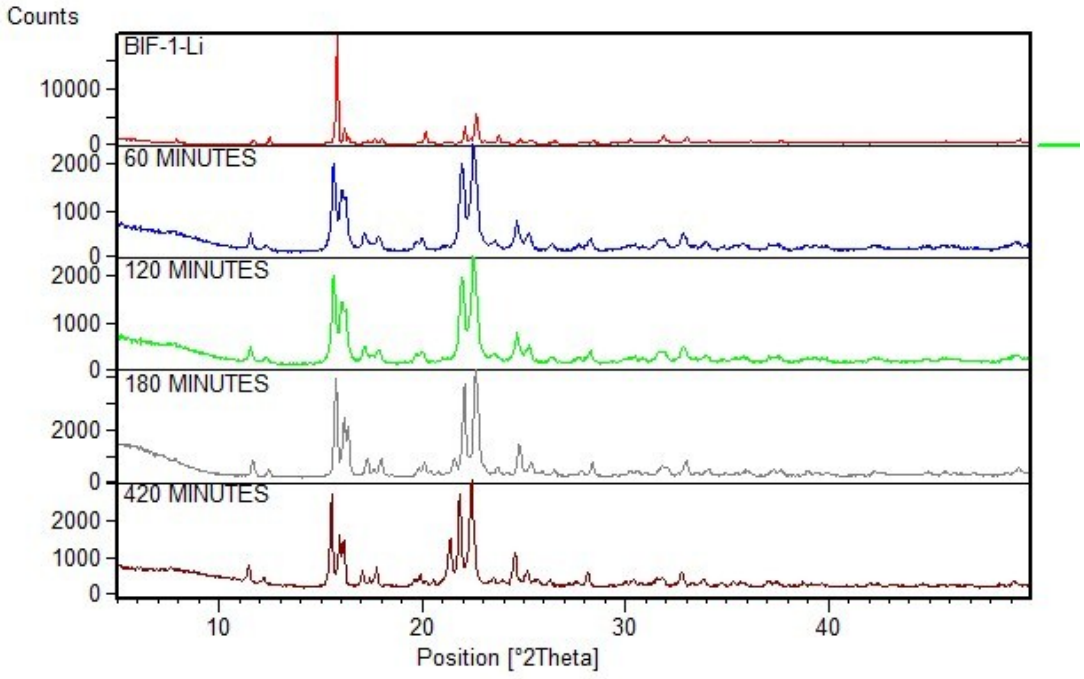

Fig. S5 PXRD of crystalline BIF-1-Li ball milled at various times.

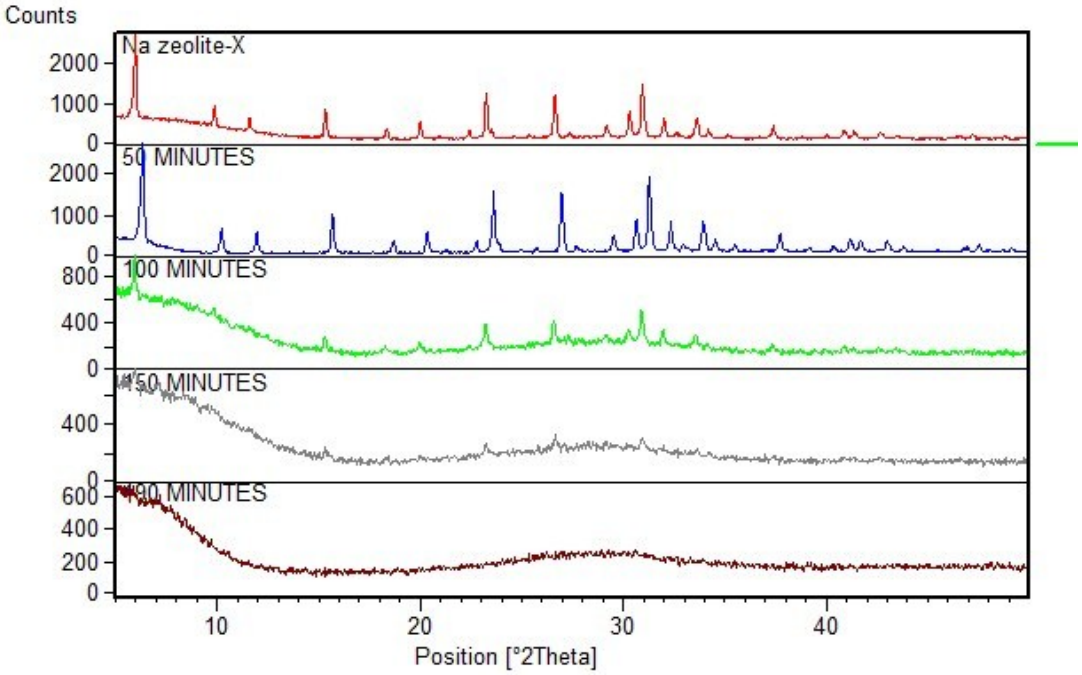

Fig. S6 PXRD of crystalline Na zeolite-X ball milled at various times.

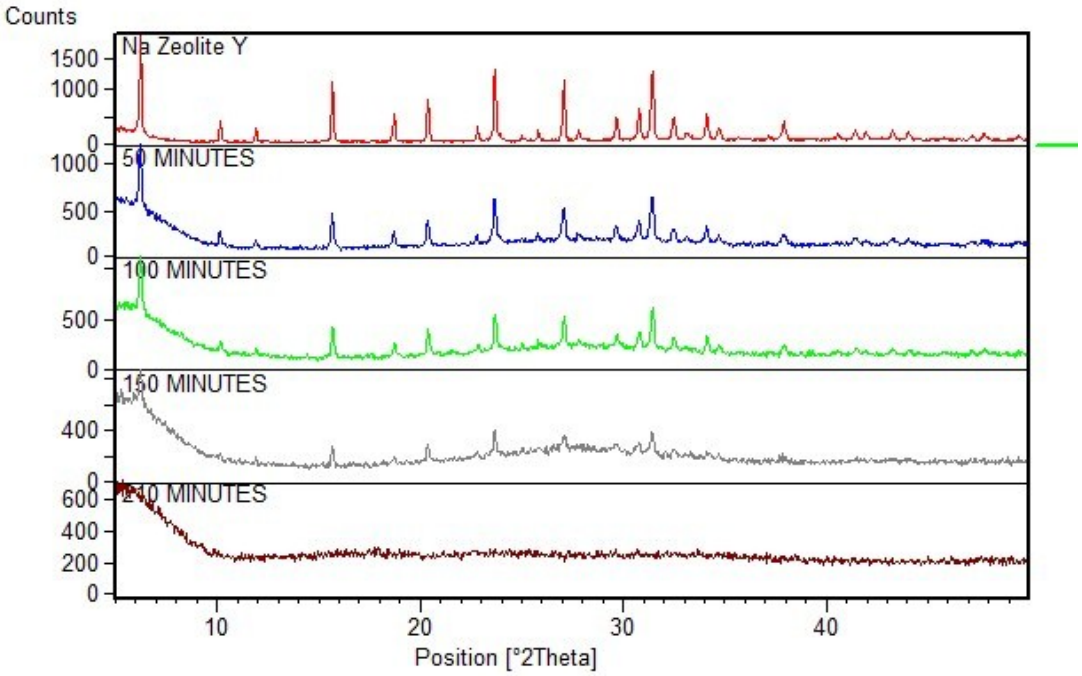

Fig. S7 PXRD of crystalline Na zeolite-Y ball milled at various times.

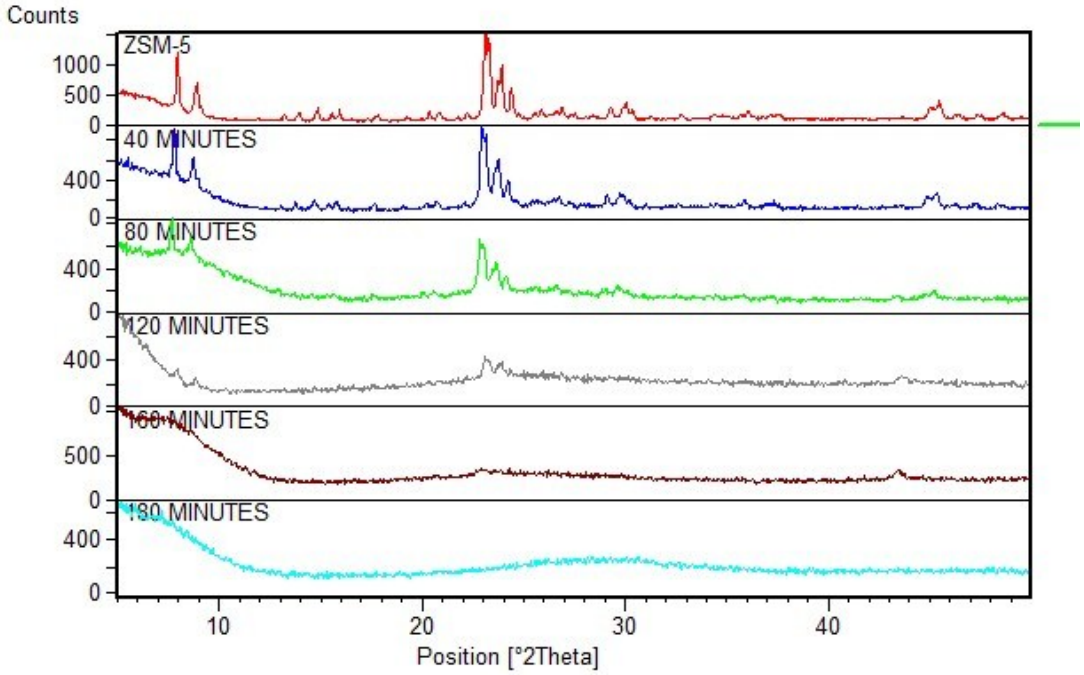

Fig. S8 PXRD of crystalline ZSM-5 ball milled at various times.

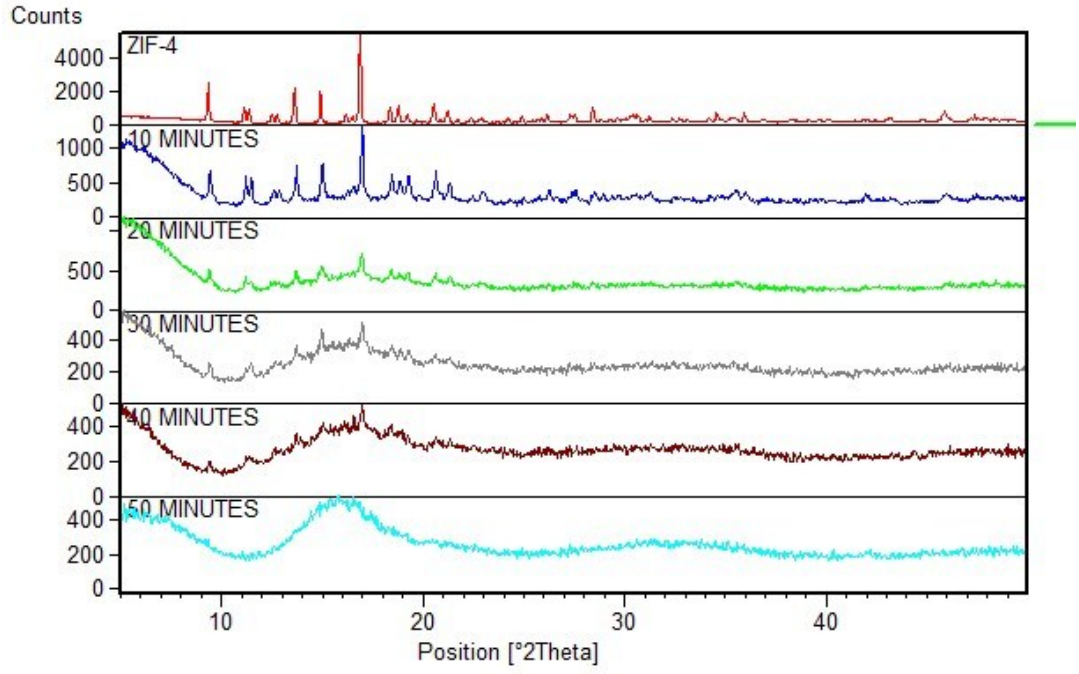

Fig. S9 PXRD of crystalline solvated ZIF-4 ball milled at various times.

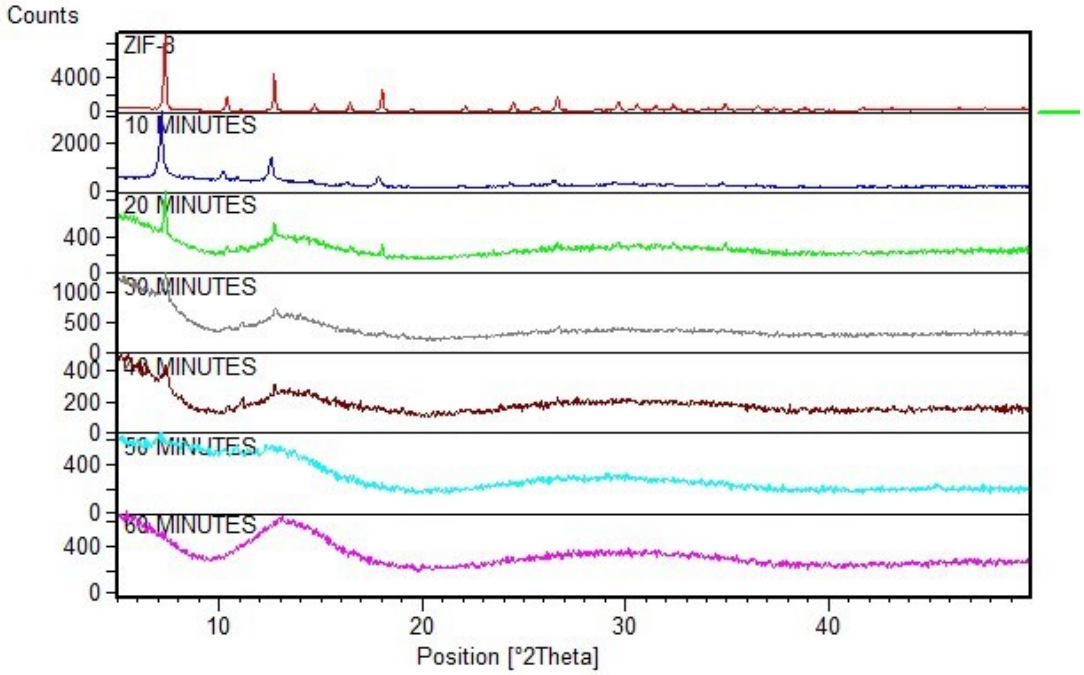

Fig. S10 PXRD of crystalline solvated ZIF-8 ball milled at various times.

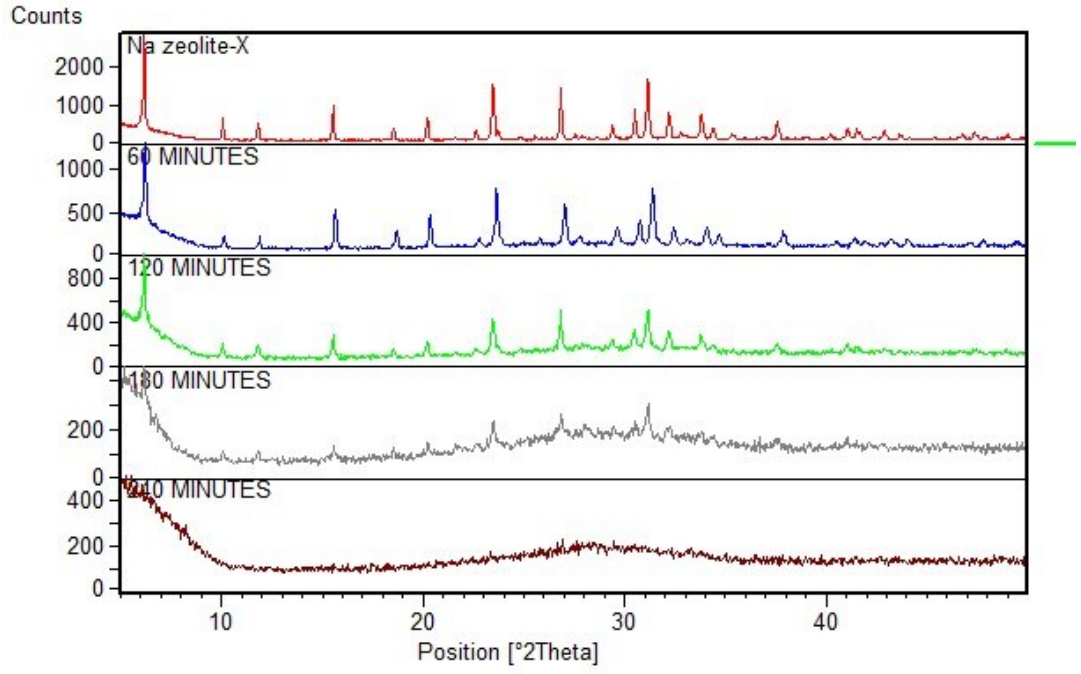

Fig. S11 PXRD of crystalline solvated Na zeolite-X ball milled at various times.

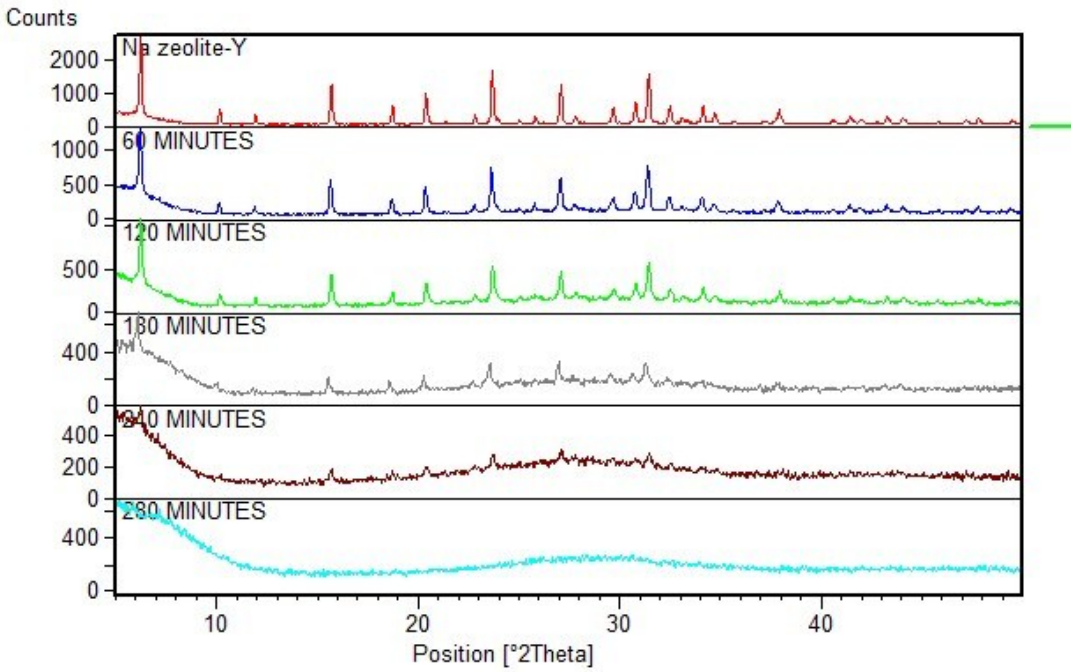

Fig. S12 PXRD of crystalline solvated Na zeolite-Y ball milled at various times.

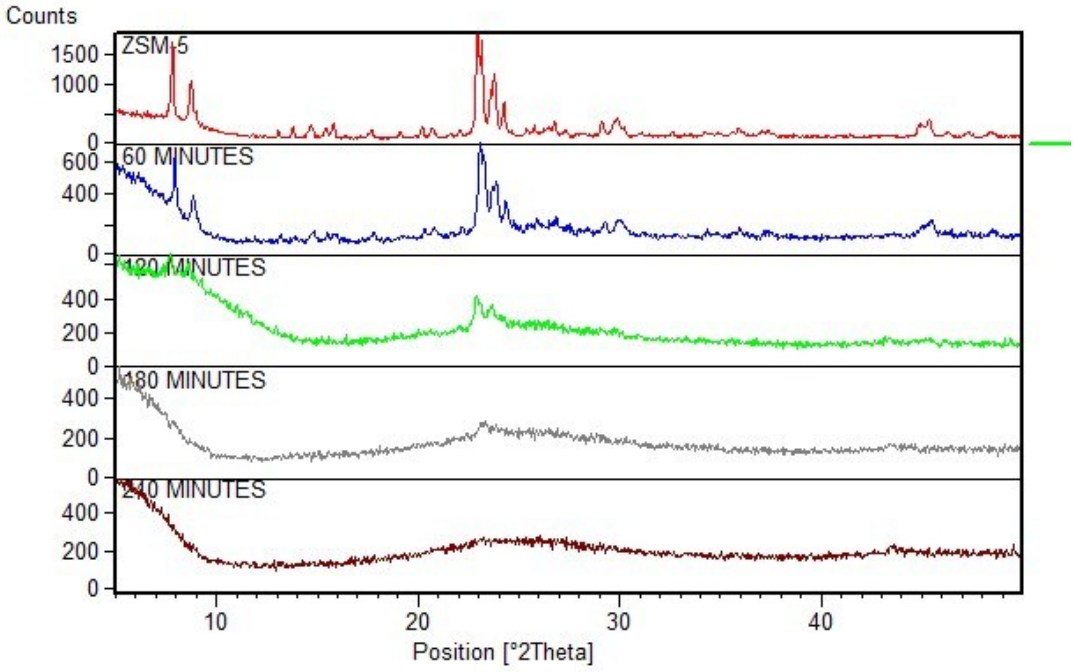

Fig. S13 PXRD of crystalline solvated ZSM-5 ball milled at various times.

Thermogravimetric Curves of Solvated Samples

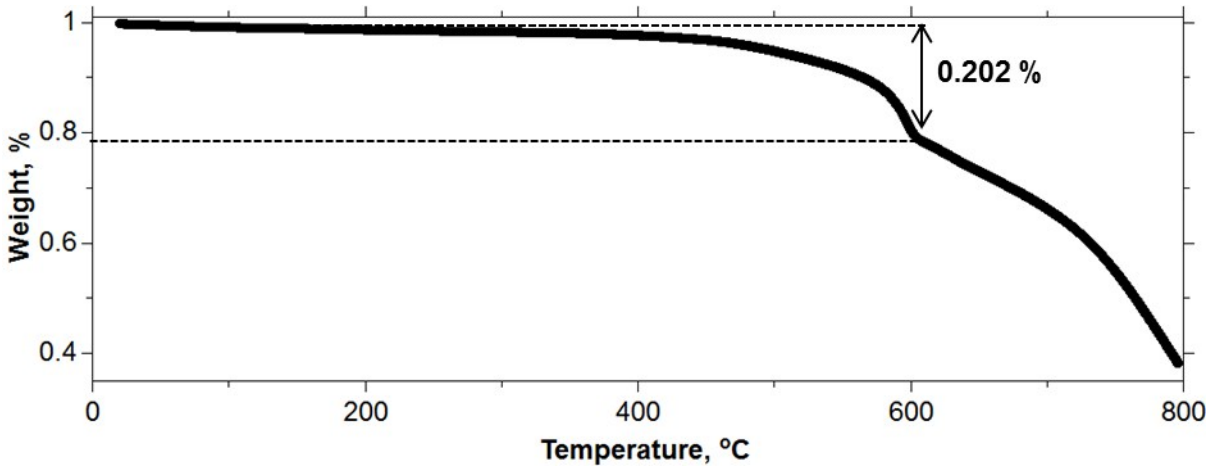

Fig. S14 TGA curve of ZIF-8 loaded with Methanol.

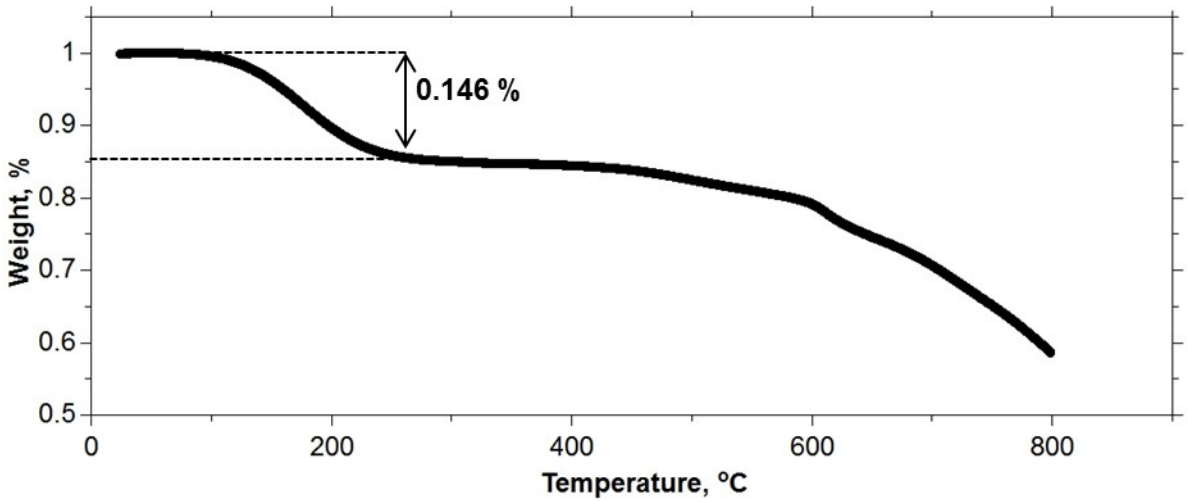

Fig. S15 TGA curve of ZIF-4 loaded with Methanol.

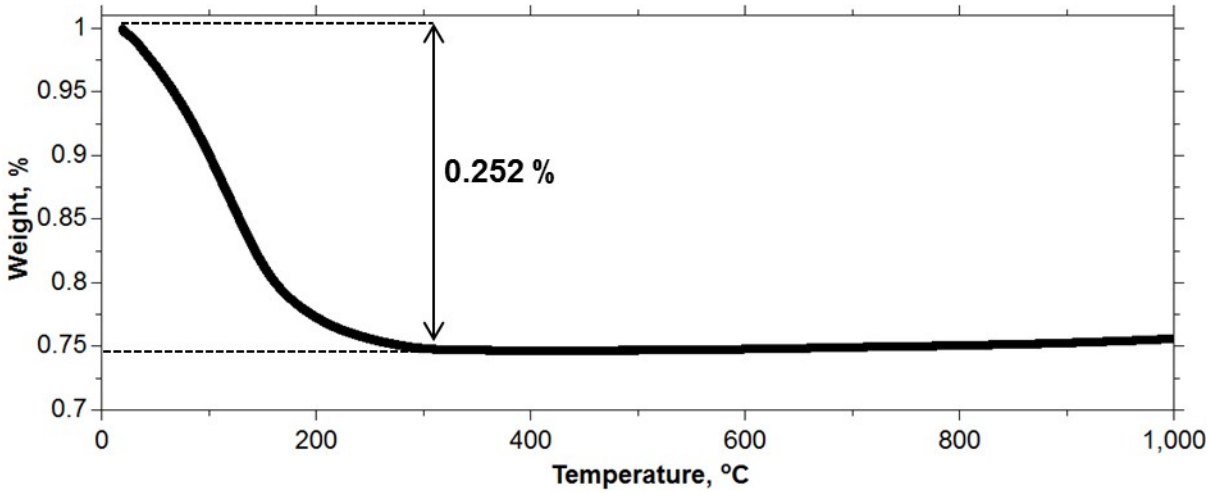

Fig. S16 TGA curve of Na zeolite-X with water.

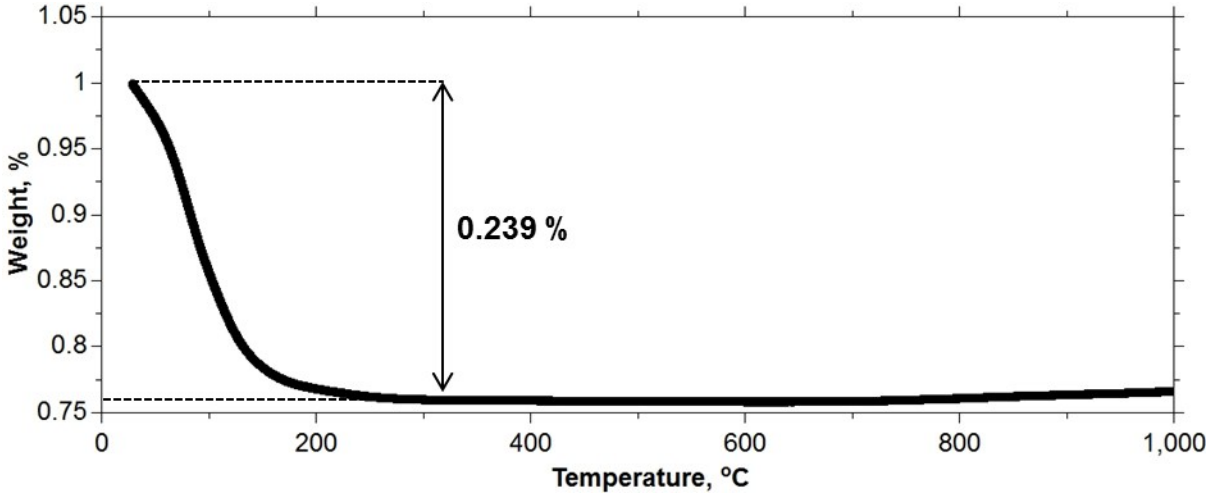

Fig. S17 TGA curve of Na zeolite-Y with water.

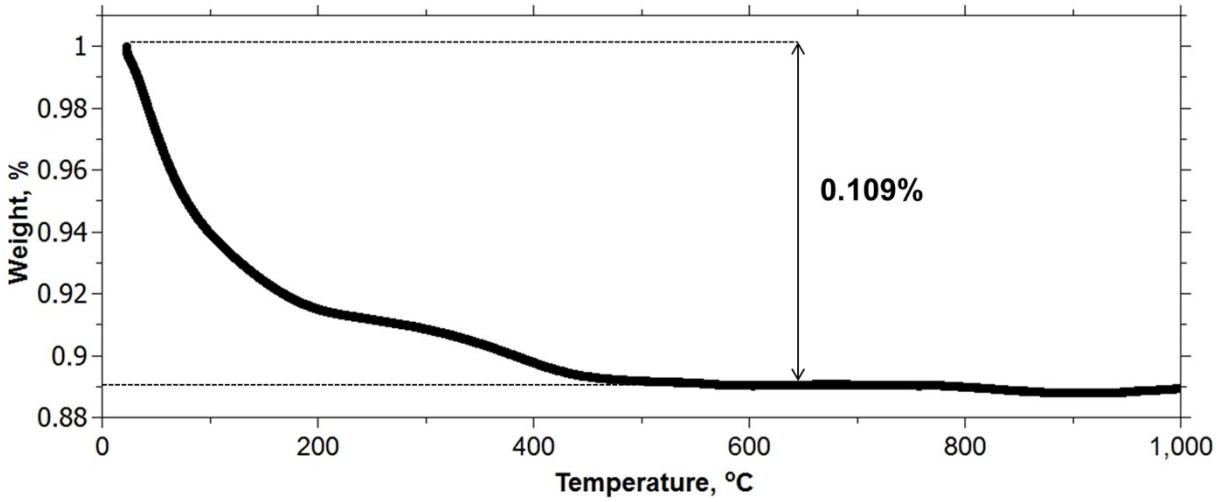

Fig. S18 TGA curve of ZSM-5 with water.

Fourier Transform Infra Red Data

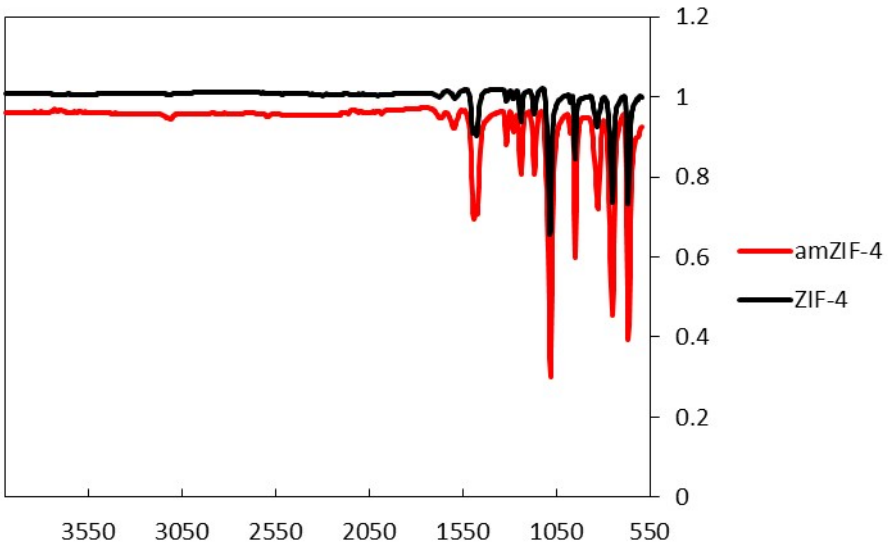

Fig. S19 FT-IR for crystalline ZIF-4 and a_mZIF-4.

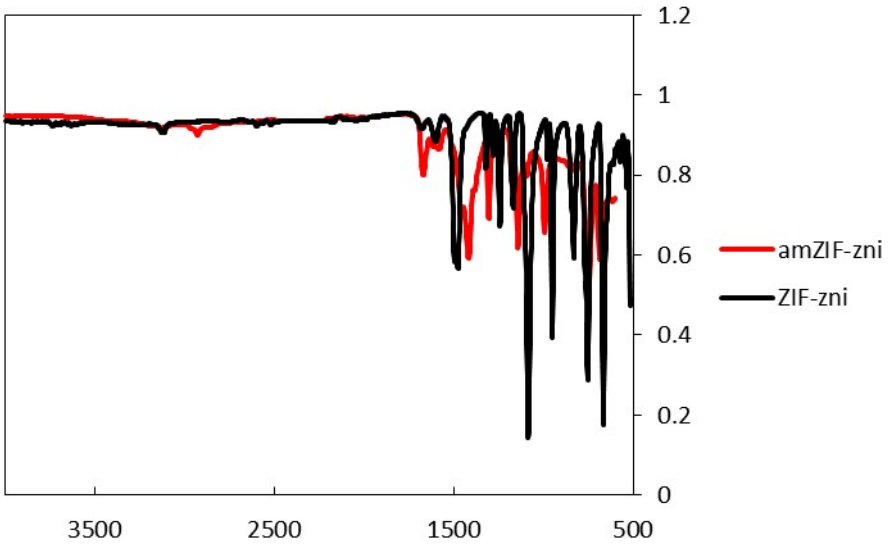

Fig. S20 FT-IR for crystalline ZIF-zni and a_mZIF-zni.

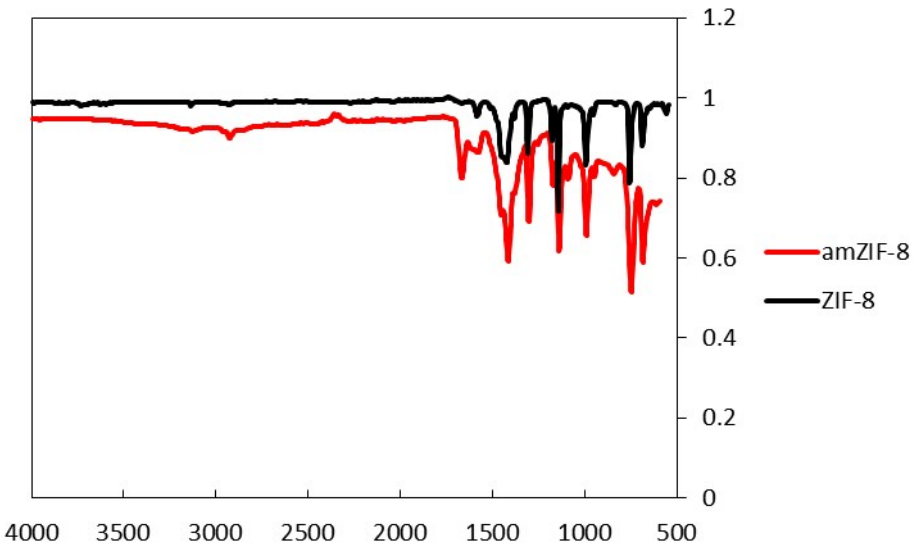

Fig. S21 FT-IR for crystalline ZIF-8 and a_mZIF-8.

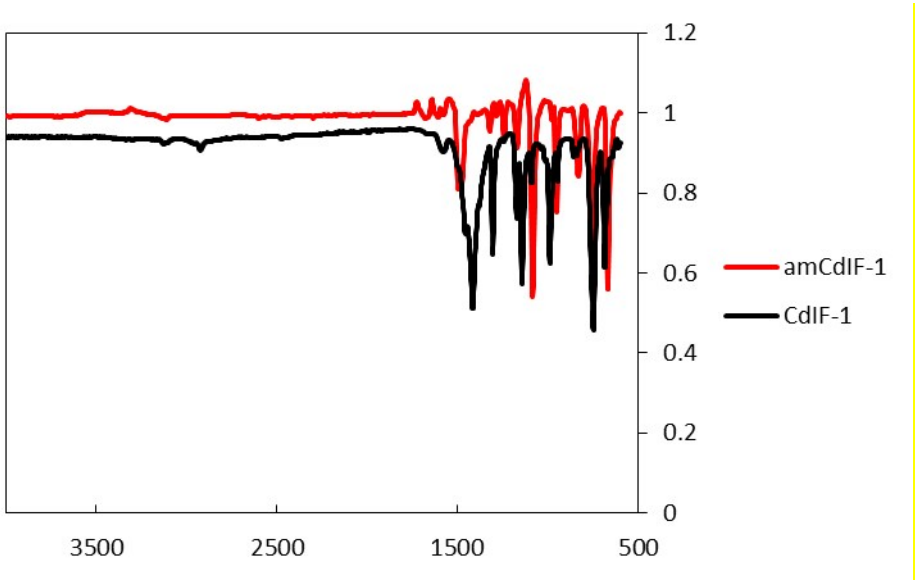

Fig. S22 FT-IR for crystalline CdIF-1 and a_mCdIF-1-20. Note that there are differences in these spectra which may be related to the features seen in the NMR work.

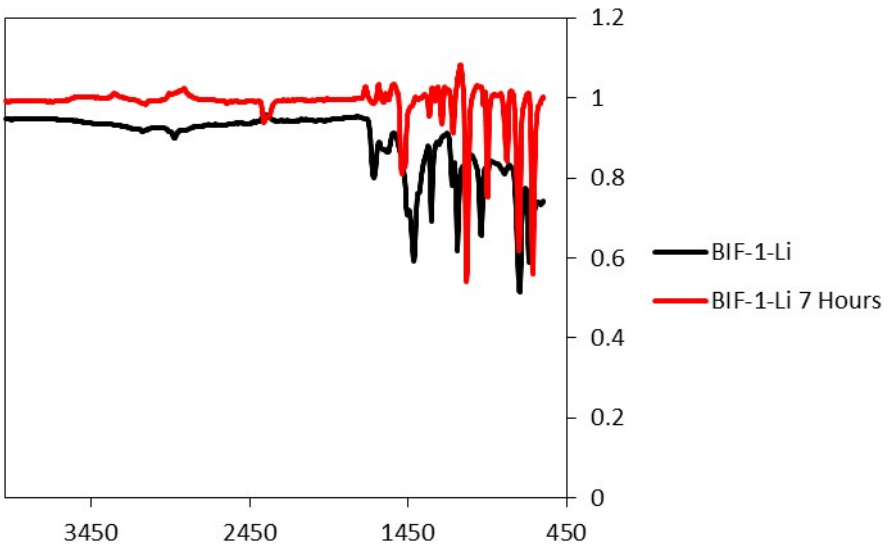

Fig. S23 FT-IR for crystalline BIF-1-Li and a_mBIF-1-Li.

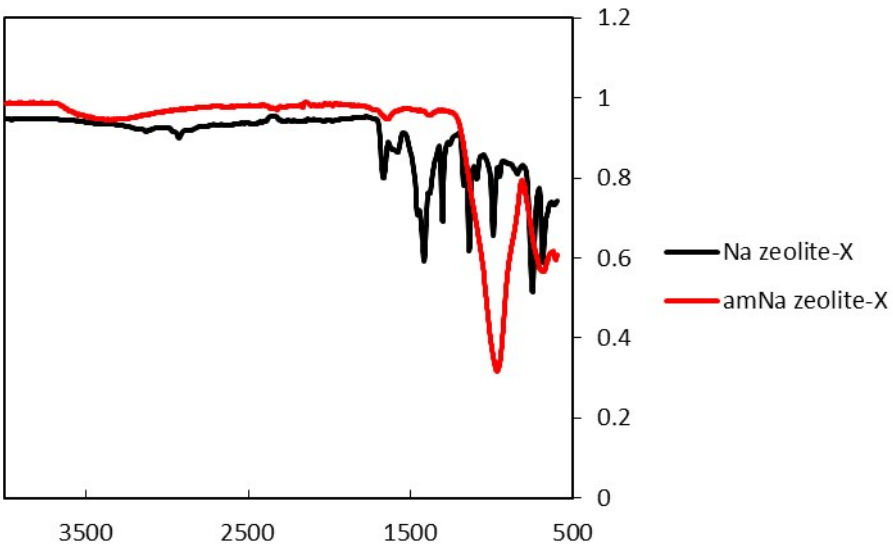

Fig. S24 FT-IR for crystalline Na zeolite-X and a_mNa zeolite-X.

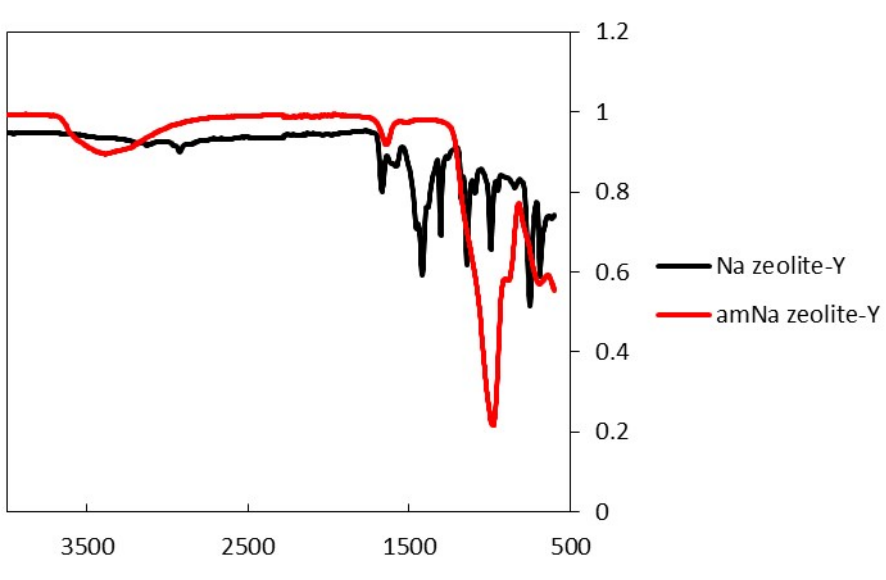

Fig. S25 FT-IR for crystalline Na zeolite-Y and a_mNa zeolite-Y.

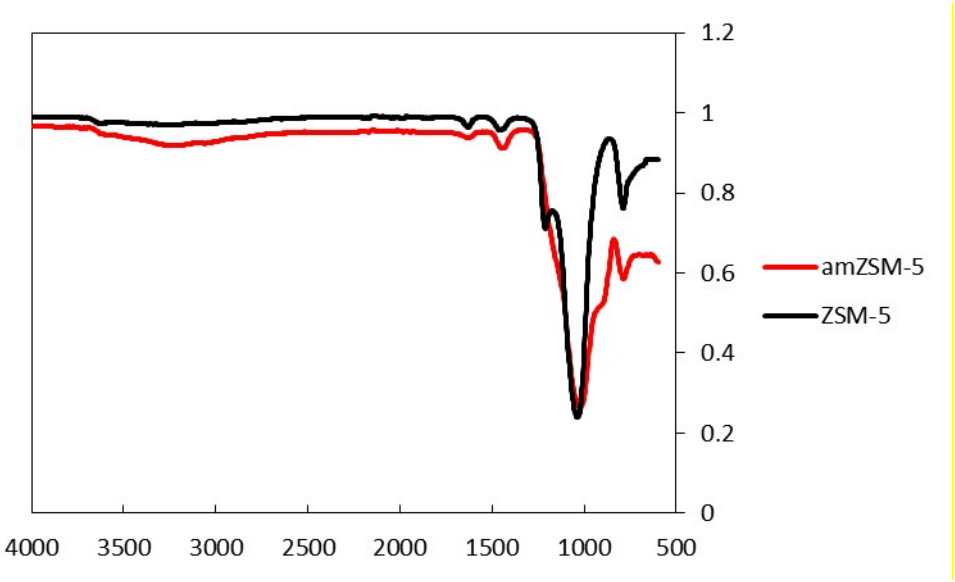

Fig. S26 FT-IR for crystalline ZSM-5 and a_mZSM-5.

Pycnometric Data

Table S1 Pycnometric Data for Crystalline and Amorphous Samples

Framework	Pycnometric Density/g cm^{-3}	Time taken to amorphize the sample/minutes
Na zeolite-Y	1.909(16)	210
a_mNa zeolite-Y	2.134(43)	-
Na zeolite-X	1.958(23)	190
a_mNa zeolite-X	2.443(41)	-
ZSM-5	2.234(33)	180
a_mZSM-5	2.611(22)	-
ZIF-zni	1.612(19)	120
a_mZIF-zni	1.624(12)	-
ZIF-8	1.451(01)	30
a_mZIF-8	1.512(19)	-
ZIF-4	1.462(05)	30
a_mZIF-4	1.574(12)	-
CdIF-1	0.923(22)	20
a_mCdIF-1	0.982(37)	-
BIF-1-Li	1.349(22)	-

SEM Images

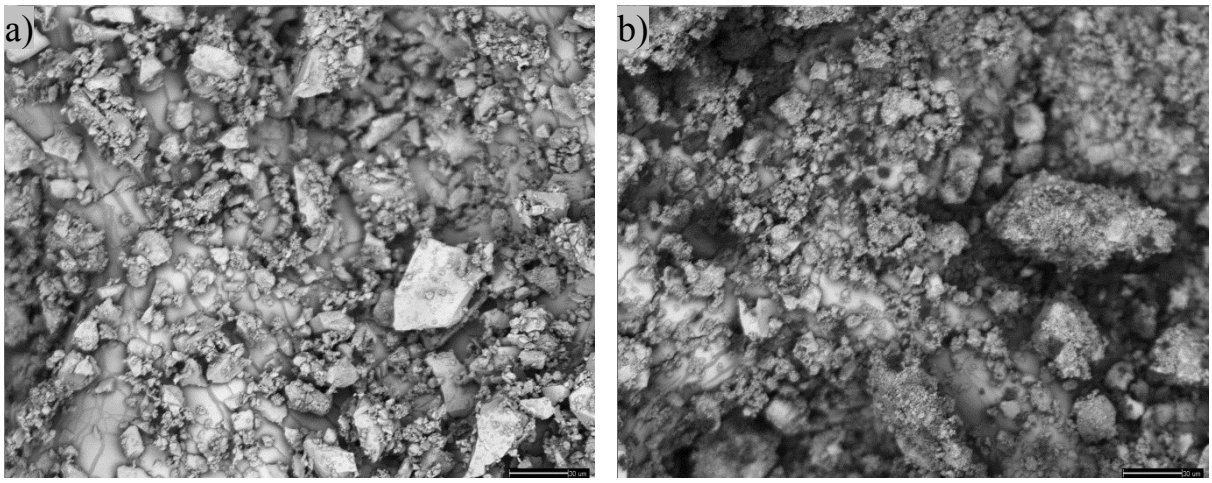

Fig. S27 Back scattered SEM images at 400x magnification for a) ZIF-4 and b) a_mZIF-4, scale bar = 30 µm.

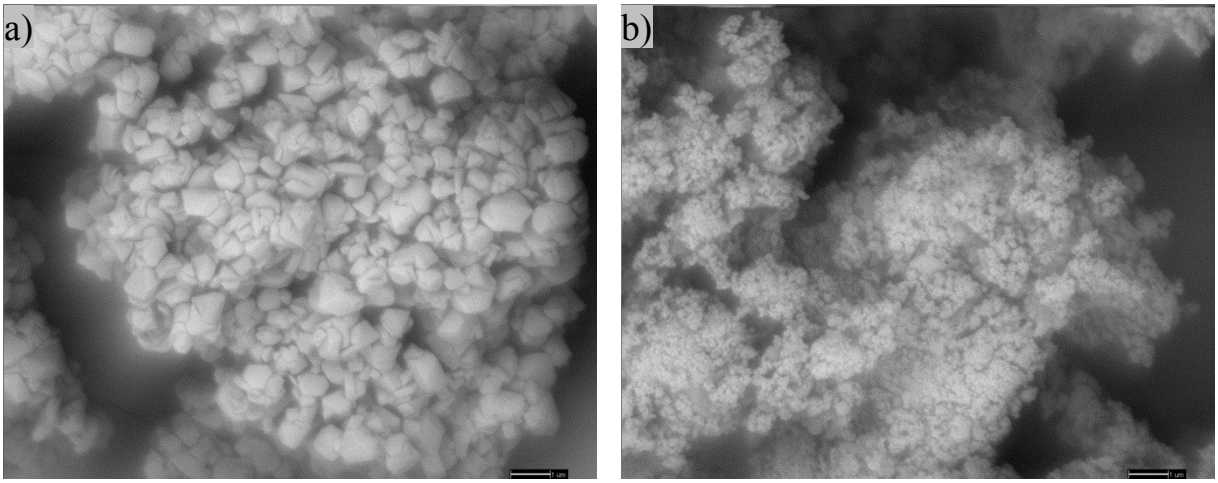

Fig. S28 Back scattered SEM images at 8000x magnification for a) Na zeolite-Y and b) a_mNa zeolite-Y, scale bar = 1 µm.

Modified Synthesis of CdIF-1

The following synthesis was modified from a previously published procedure.[1] The original procedure resulted in an impurity (shown in Figure S29) at 14.5 and 16.5 °2θ. By adjusting the temperature from 120 °C to 140 °C and the length of the reaction from 24 hours to 48 hours, only the pure CdIF-1 phase was formed. Unfortunately the CdIF-1 sample analysed using total-scattering techniques contained these impurities (Figure S18) which could explain the reduced data quality mentioned in the main paper, however the NMR samples were pure.

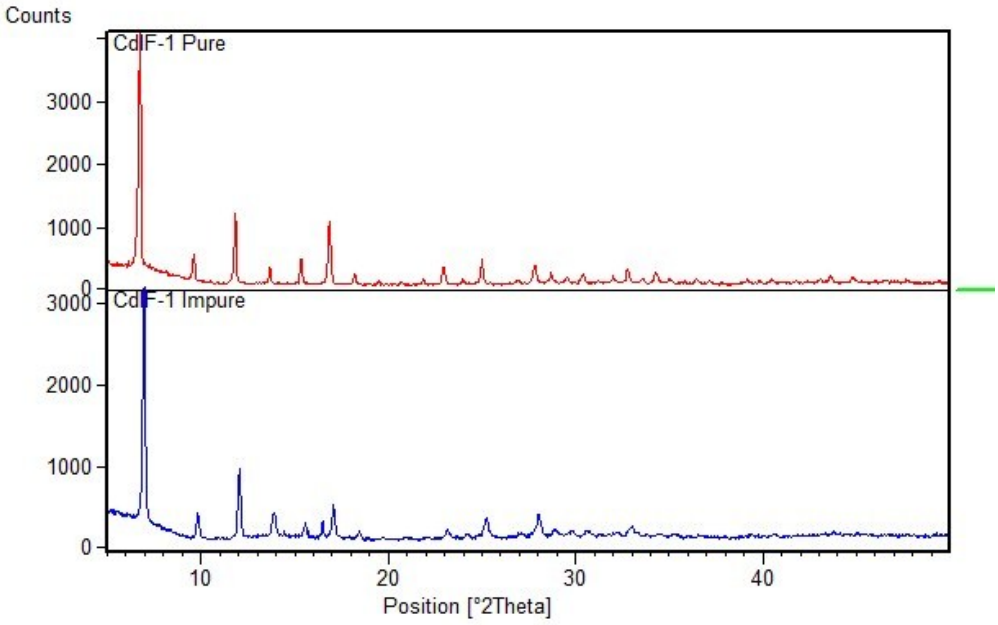

Fig. S29 Comparison of PXRD patterns for pure and impure CdIF-1.

^{1}H NMR Data

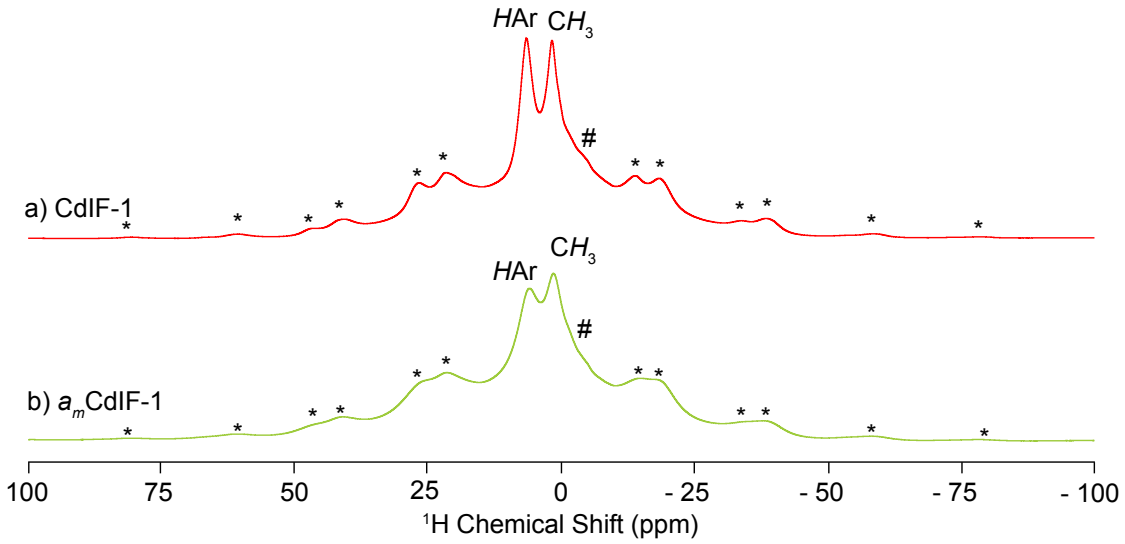

Fig. S30 ^{1}H MAS NMR spectra of a) CdIF-1 and b) a_mCdIF-1-20 obtained at 9.4 T Asterisks denote spinning sidebands.

^{1}H-^{15}N CP NMR Data

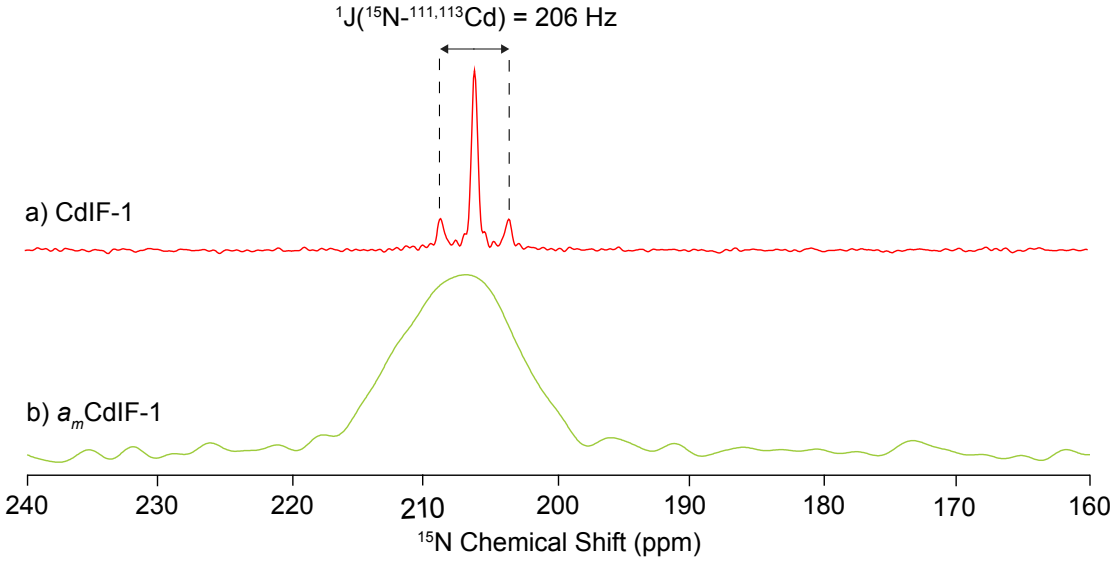

Fig. S31 ^{15}N CP MAS NMR spectra of a) CdIF-1 and b) a_mCdIF-1-20 recorded at 9.4 T. The coupling constant of the doublet arising from the indirect ^{1}J(^{15}N-^{111,113}Cd) spin spin coupling is given.

1. Y.-Q. Tian, S.-Y. Yao, D. Gu, K.-H. Cui, D.-W. Guo, G. Zhang, Z.-X. Chen and D.-Y. Zhao, *Chem. Eur. J.*, 2010, **16**, 1137-1141.