Electronic Supplementary Material (ESI) for RSC Advances.

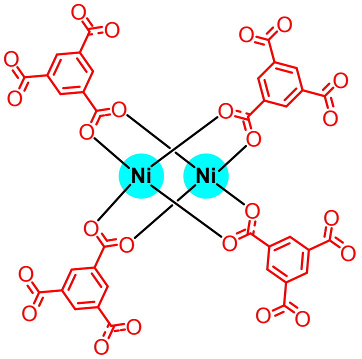

Figure S1. Hypothetical Structure of Ni_3-$(BTC)_2$ MOF

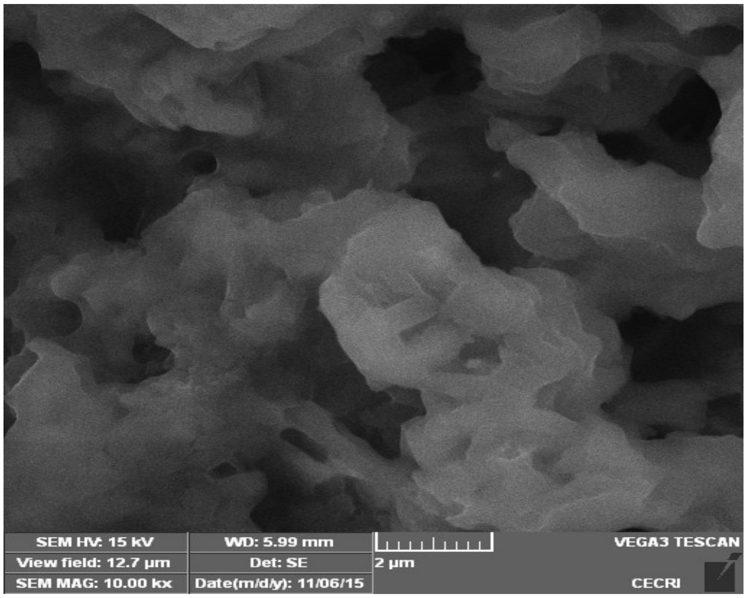

Figure S2. SEM image of Ni_3-$(BTC)_2$ MOF

The surface morphology of synthesized Ni_3- $(BTC)_2$ was investigated by SEM, which shows a flaky structure. The EDAX investigation represents high intensity peak for the elements Ni, C, O that are present in the MOF.

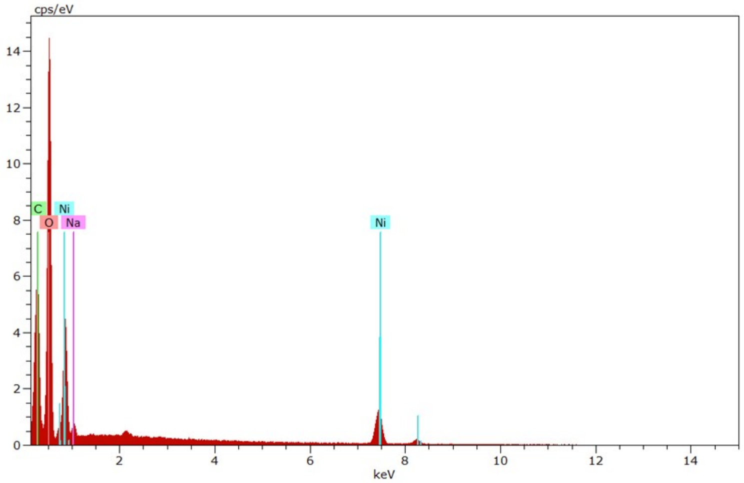

Figure S3. EDAX measurements of Ni_3-$(BTC)_2$ MOF

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El AN  Series  unn. C norm. C Atom. C Error (1 Sigma) K fact. Z corr. A corr.
F corr.

               [wt.%]  [wt.%]  [at.%]          [wt.%]

-----------------------------------------------------------------------------

O   8  K-series  53.10   49.44   52.11            6.17   0.655   0.755   1.000
1.000

C   6  K-series  31.66   29.48   41.39            3.94   0.645   0.457   1.000
1.000

Ni  28 K-series  21.56   20.07    5.77            0.72   0.099   1.918   1.000
1.059

Na  11 K-series   1.09    1.01    0.74            0.10   0.007   1.539   1.000
1.001

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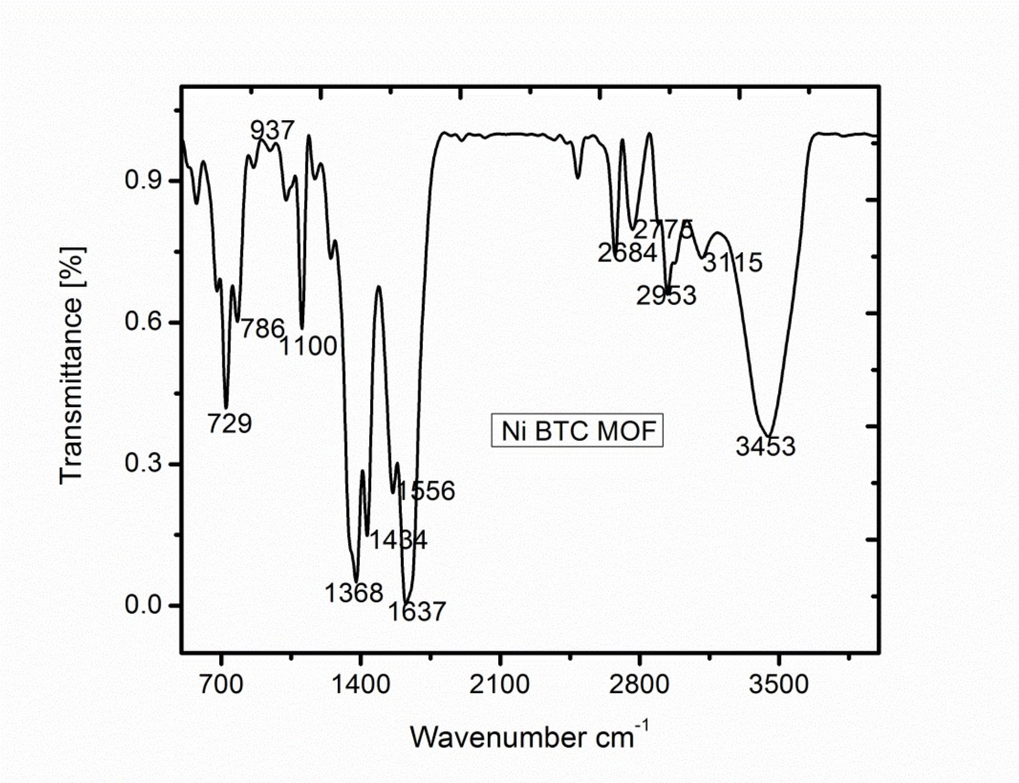

Figure S4. FT-IR spectrum of Ni_3- $(BTC)_2$ MOF

FT-IR analysis

The FT-IR measurement has been used as a powerful tool to confirm the formation of Ni_3-$(BTC)_2$. C-H stretching and asymmetric bending bands appeared at 2775, 2953cm^{-1} and 1434 cm^{-1} respectively. C-O-C stretching vibration band appeared at 1100 cm^{-1}.Strong absorption bands for at 1637 and 1556 cm^{-1} and between 1434 and 1368 cm^{-1} are attributed to bound C–O group, ν_{asym} and ν_{sym}, respectively [3], indicating that the BTC is coordinated to Ni. The presence of broad O–H absorption peak between 3453 cm^{-1} indicates that some of the carboxyl groups are not fully deprotonated which, in turn, accounts for the presence of some free carboxylate not coordinated to metal center. On the other hand the OH peak of BTC at about 935 cm^{-1} was deformed[2] and intensity of the peak was suppressed upon connection of the organic structure with the metal ions. Finally the peak at 1637 cm^{-1} confirms that Ni is coordinated with –COO– moieties.

XRD

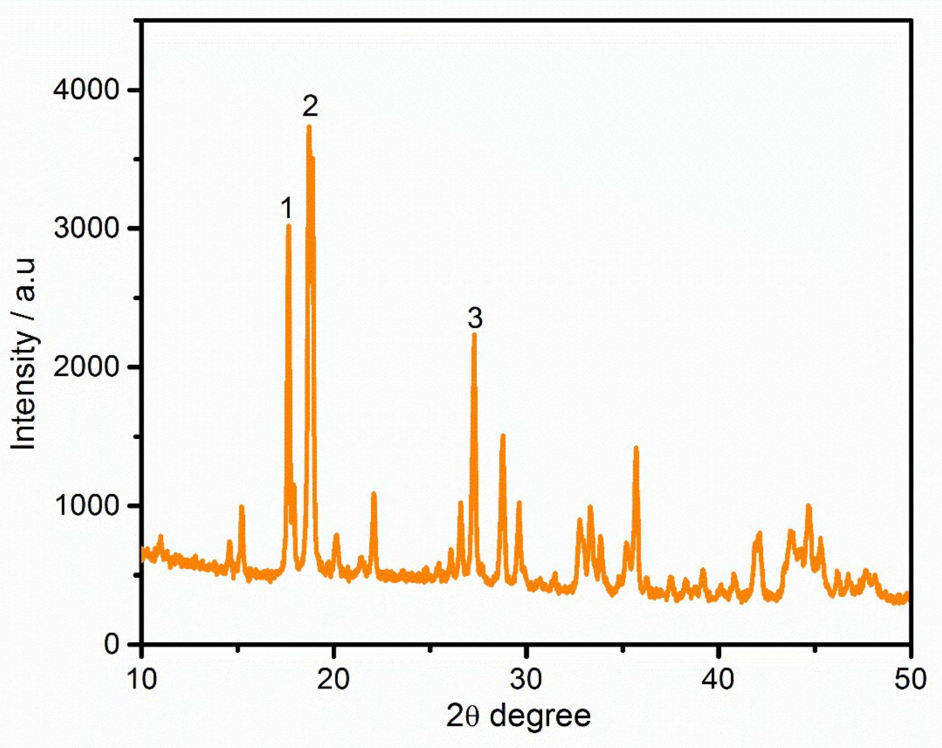

Figure S5. XRD patterns of Ni_3- $(BTC)_2$

The Ni_3- $(BTC)_2$ -MOF shows several characteristic peaks below 20° in 2θ, which is identical to the simulated pattern from its single crystal structure [4]. These 2θ values are in accordance with the reported values (2θ = 17.857, 18.843 and 27.487°)[2]. TMA–Ni MOF exhibits some crystallinity as indicated by stronger diffraction peaks. These results implies that the crystallinity increases from left to right in the Periodic Table for Mn(II), Ni(II), and Cu(II) ions upon complex formation with TMA. This could be due to the addition of an extra electron to the d orbitals from left to right, resulting in better and stronger complex formation of Ni(II) with TMA.

References

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