

*Electronic Supplementary Information (ESI)*

**One Step Synthesis of Bimetallic (Ni and Co) Metal-Organic Framework for the  
Efficient Electrocatalytic Oxidation of Water and Hydrazine†**

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†Electronic supplementary information (ESI) is available as mentioned in the text

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**Table S1:** Impedance parameters for the MOF coated GC electrodes

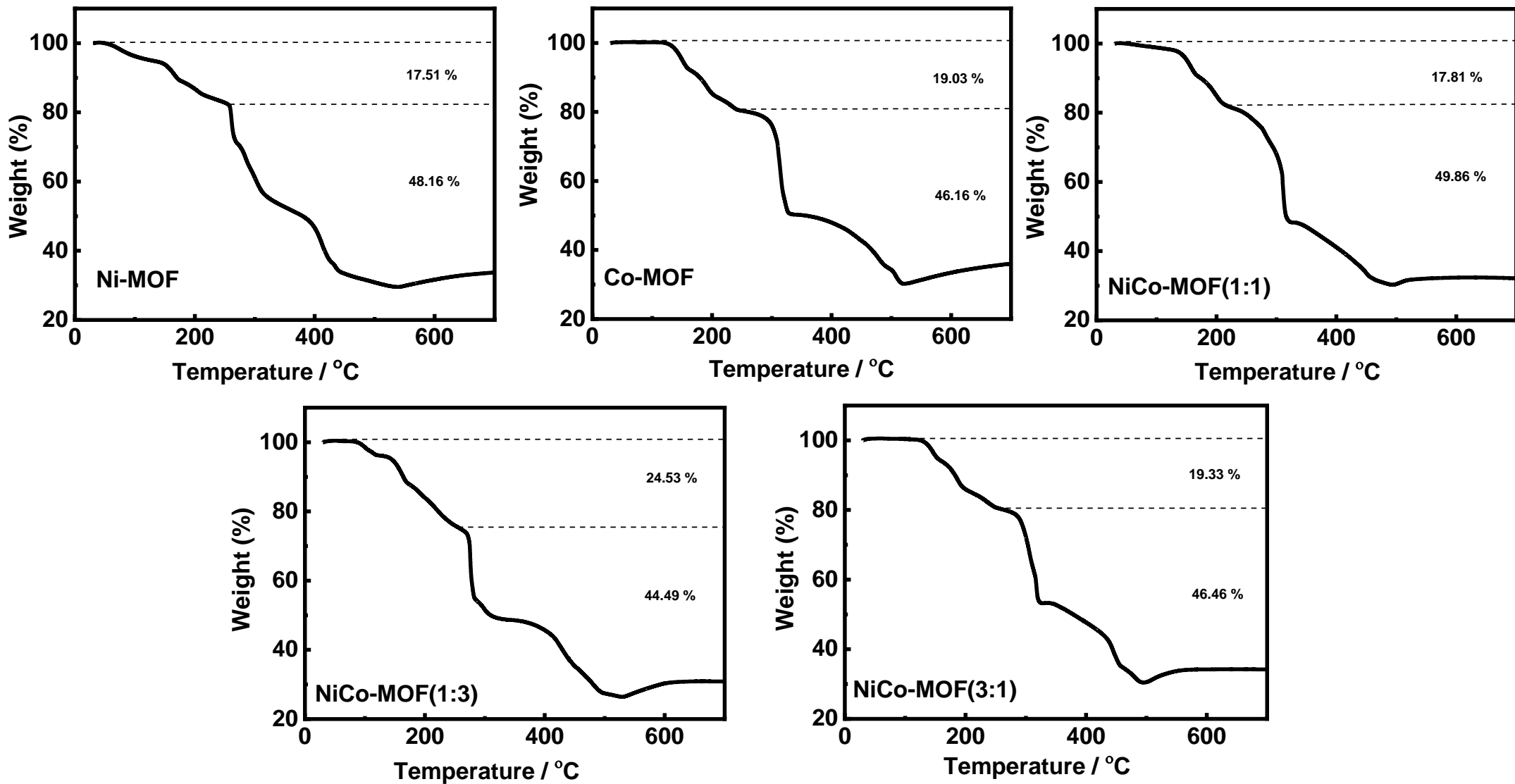
<b>Material</b>	<b><math>R_s</math> (<math>\Omega</math>)</b>	<b><math>R_{ct}</math> (<math>\Omega</math>)</b>
Ni-MOF	55.59	6720
Co-MOF	81.68	1593
NiCo-MOF (1:1)	84.68	1524
NiCo-MOF (1:3)	81.89	2885
NiCo-MOF (3:1)	64.69	6552

**Table S2:** ECSA of the synthesized MOFs in 1.0 M KOH

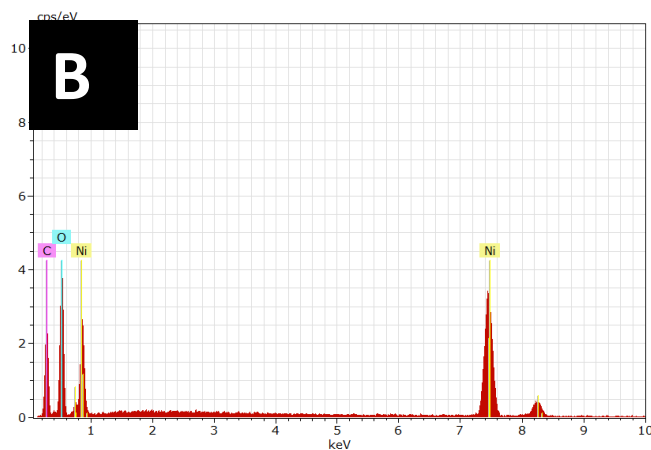
<b>MOFs</b>	<b>ECSA (cm<sup>2</sup>)</b>
Ni-MOF	12
Co-MOF	100
NiCo-MOF (1:1)	105
NiCo-MOF (1:3)	49
NiCo-MOF (3:1)	14

**Table S3:** Recovery analysis of HZ present in real samples using GC/NiCo-MOF (1:1) electrode.

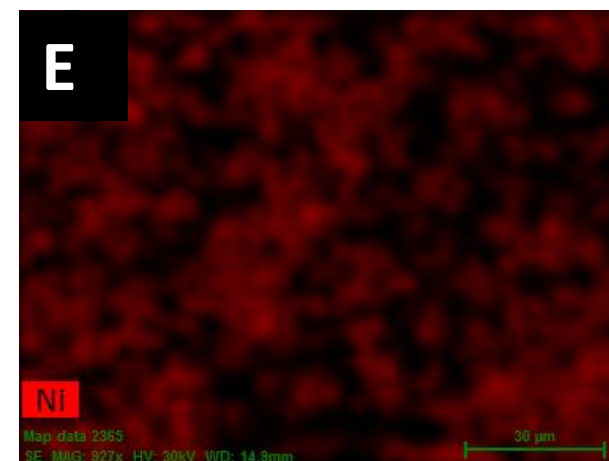
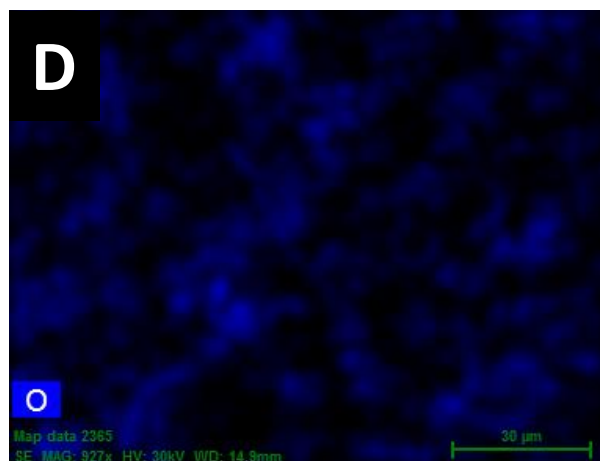
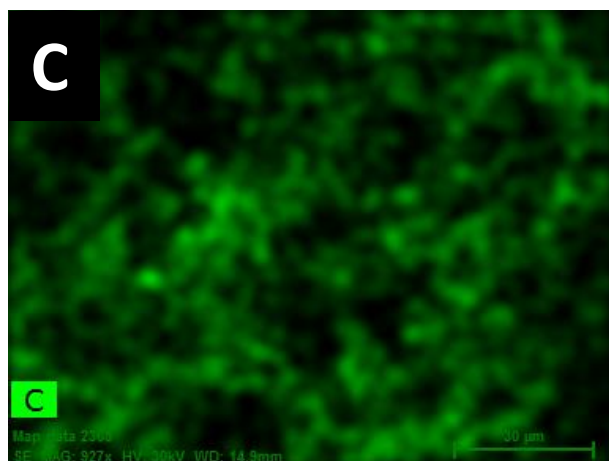
<b>Samples</b>	<b>HZ added (<math>\mu\text{M}</math>)</b>	<b>HZ found (<math>\mu\text{M}</math>)</b>	<b>Recovery (%)</b>	<b>RSD (%)</b>
<b>Cigarette (Capstan) extract (40<math>\mu\text{L}</math>) Detected: 27.8 <math>\mu\text{M}</math></b>	125	134	104	1.4
	250	239	95.9	1.2
	375	342	91.4	3.5
<b>Tap water (40<math>\mu\text{L}</math>) Detected: 0.0 <math>\mu\text{M}</math></b>	125	114	91.3	6.4
	250	232	92.9	7.3
	375	355	94.7	7.5



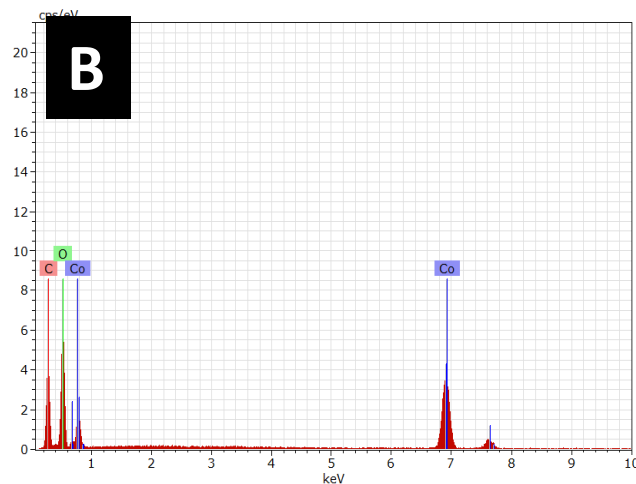
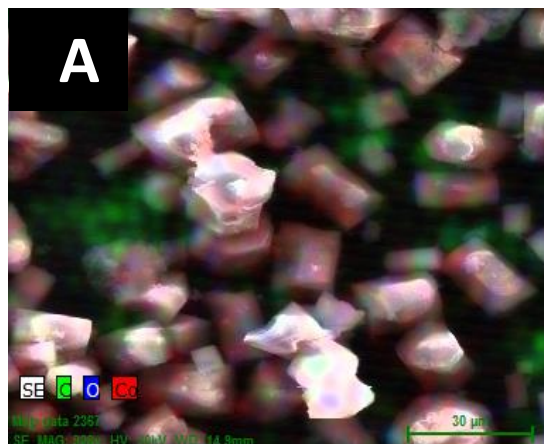
**Fig. S1.** TGA plots of Ni-MOF, Co-MOF, NiCo-MOF (1:1), NiCo-MOF (1:3), and NiCo-MOF (3:1).



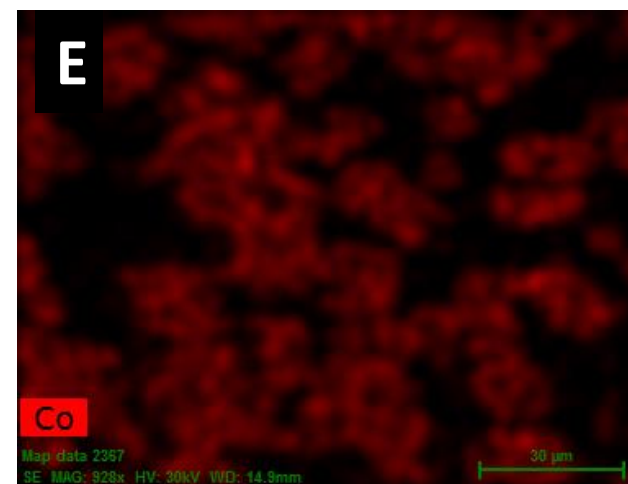
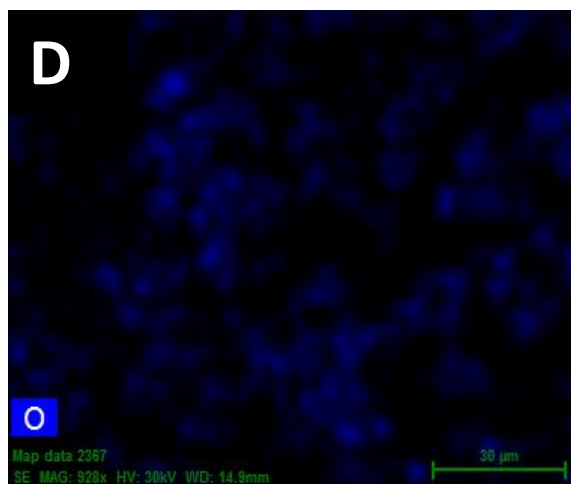
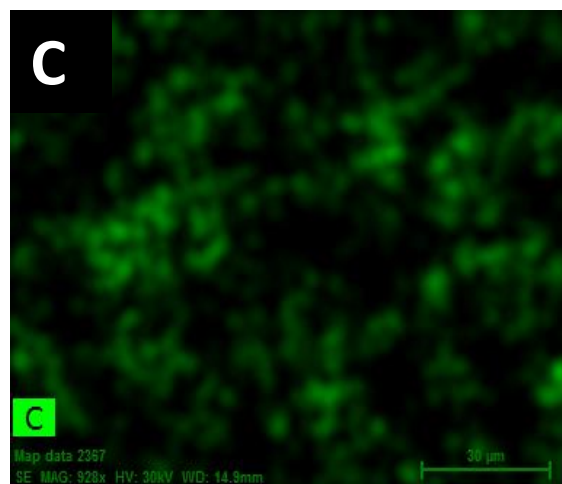
Element	Atomic %	Weight %
Carbon	47.26	34.67
Oxygen	47.45	46.36
Nickel	5.29	18.97



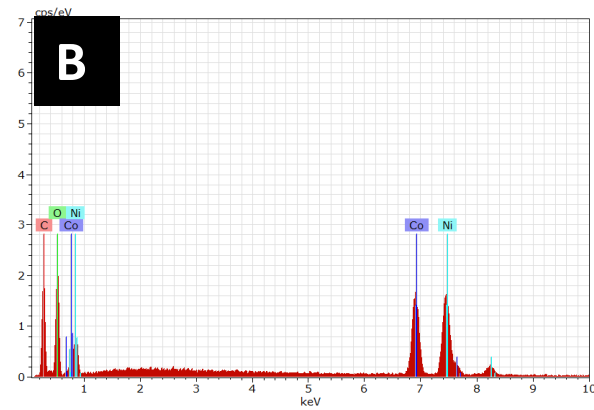
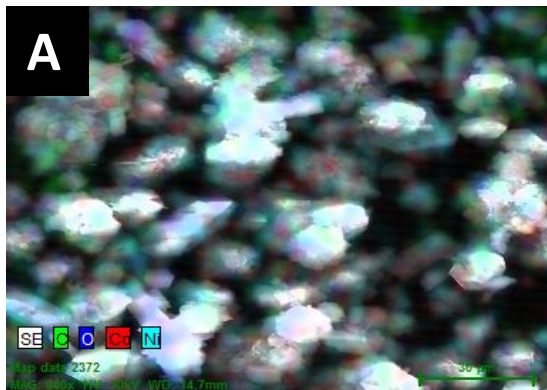
**Fig. S2.** EDAX and mapping of Ni-MOF indicating the presence of expected elements.



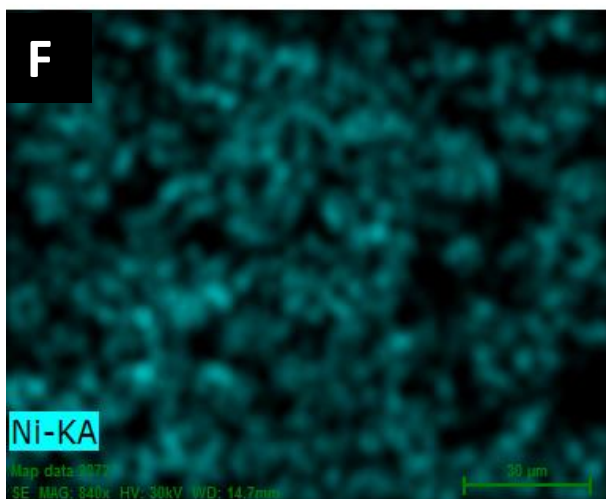
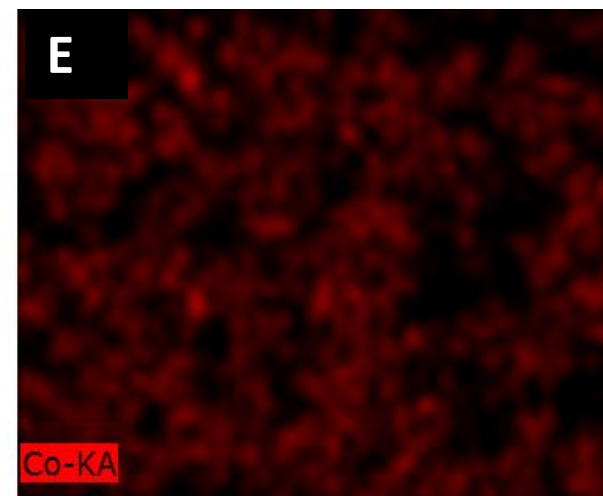
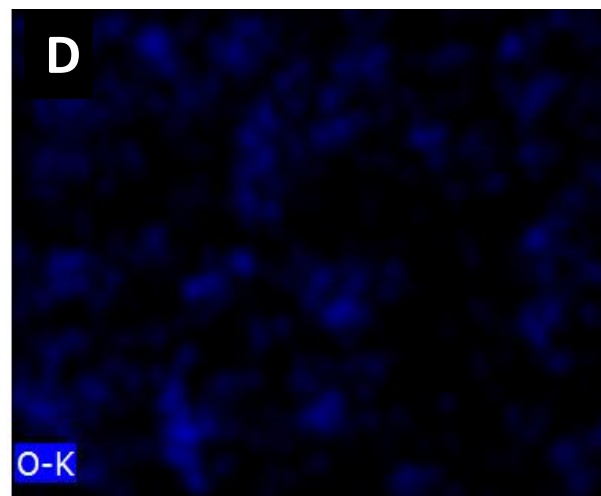
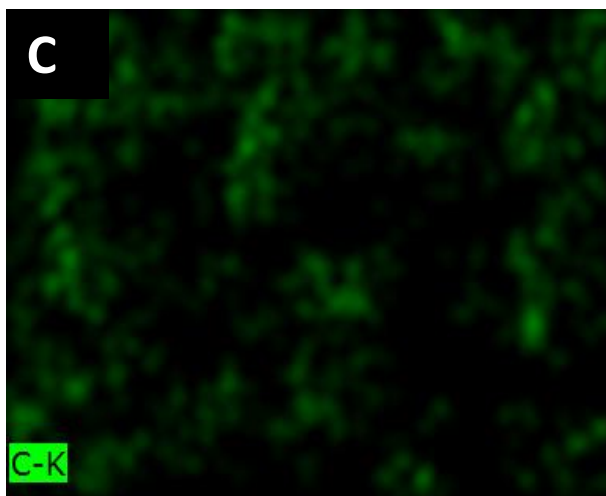
Element	Atomic %	Weight %
Carbon	47.75	36.94
Oxygen	48.92	50.41
Cobalt	3.33	12.65



**Fig. S3.** EDAX and mapping of Co-MOF indicating the presence of expected elements.

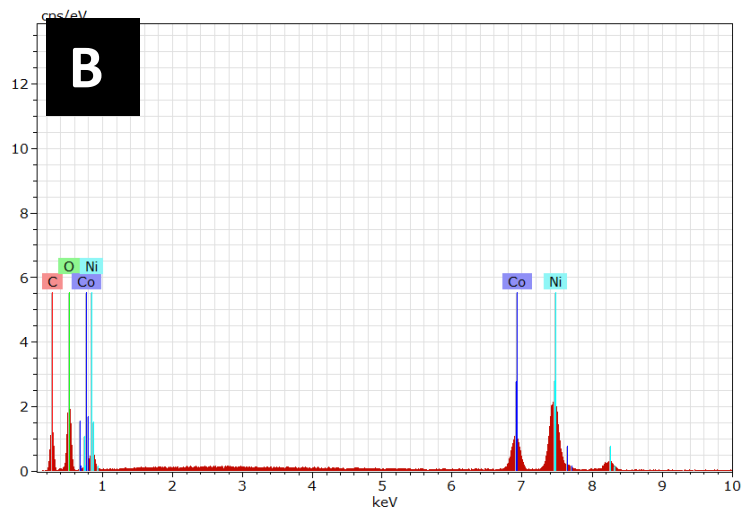
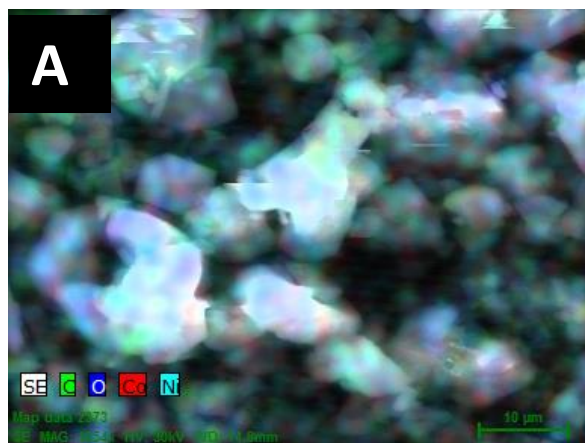


Element	Atomic %	Weight %
Carbon	53.50	38.40
Oxygen	39.80	38.06
Nickel	3.53	12.37
Cobalt	3.17	11.18

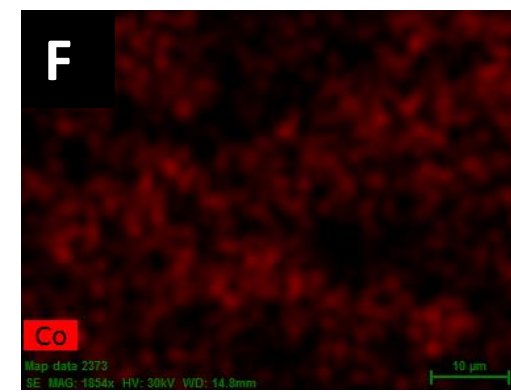
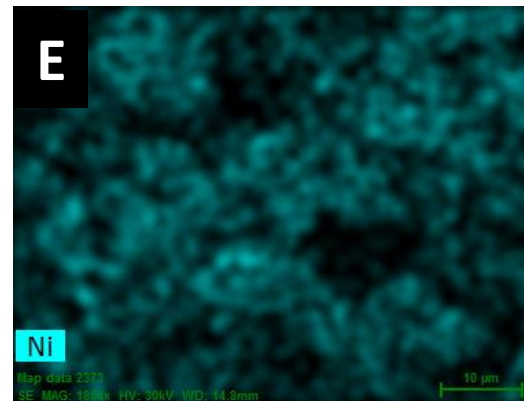
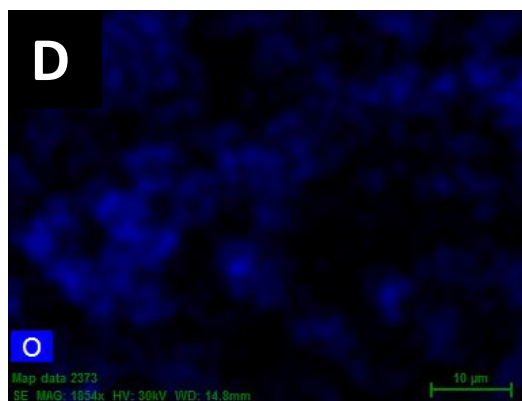
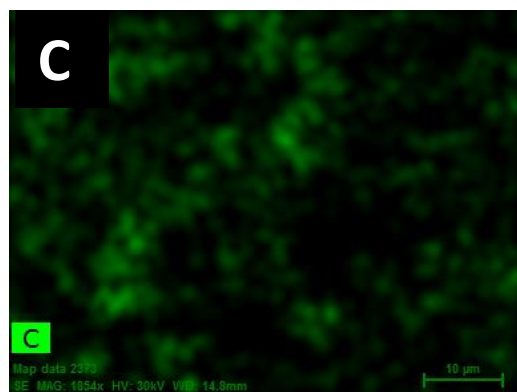


**Fig. S4.** EDAX and mapping of NiCo-MOF (1:1) indicating the presence of expected elements.

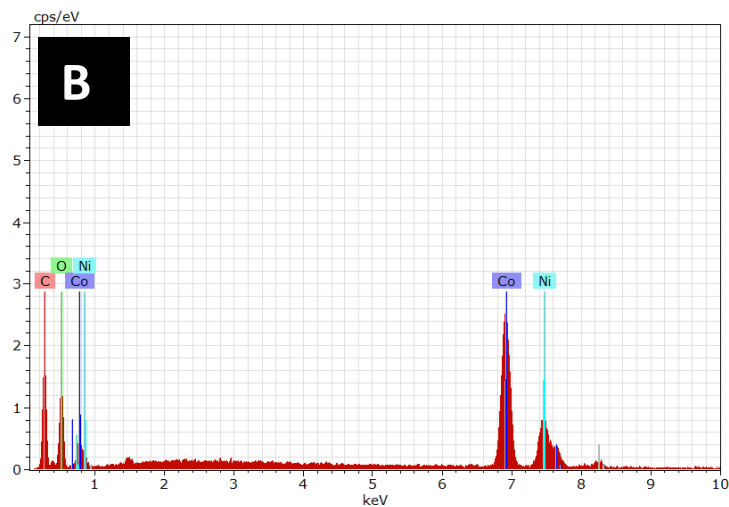
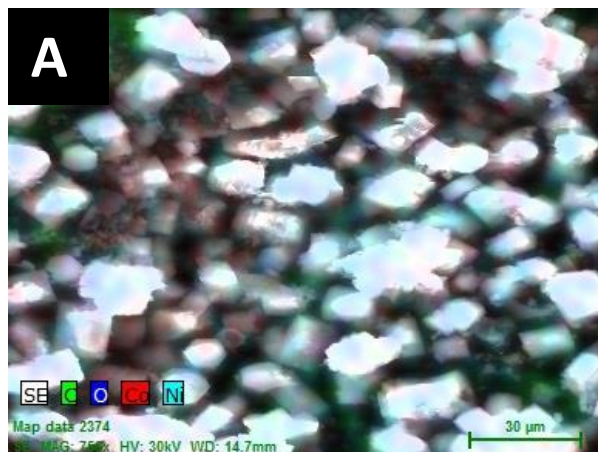




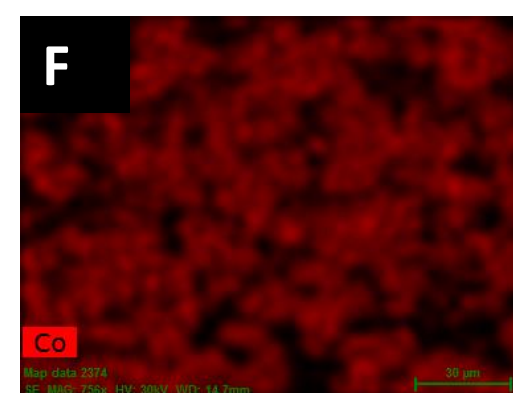
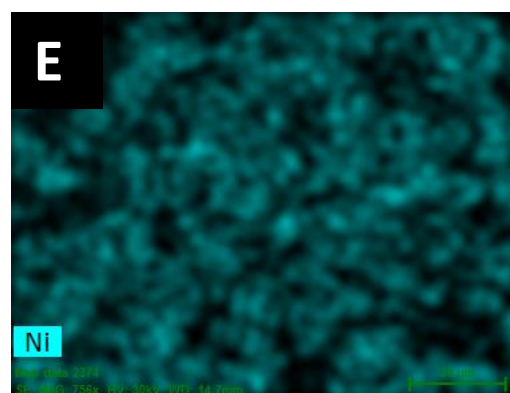
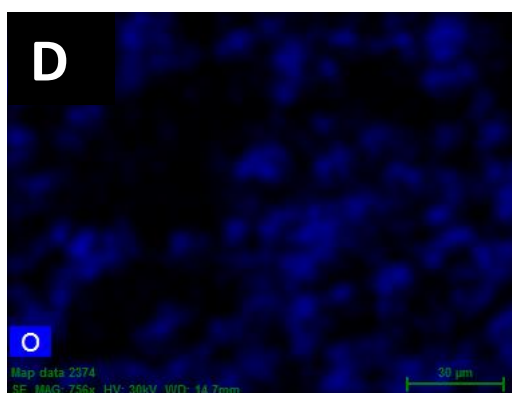
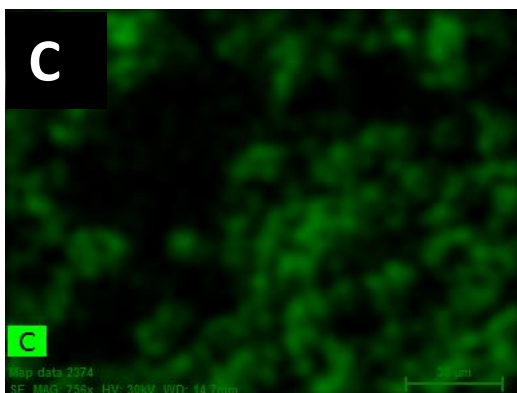
Element	Atomic %	Weight %
Carbon	48.07	32.45
Oxygen	43.25	38.89
Nickel	6.20	20.44
Cobalt	2.48	8.22



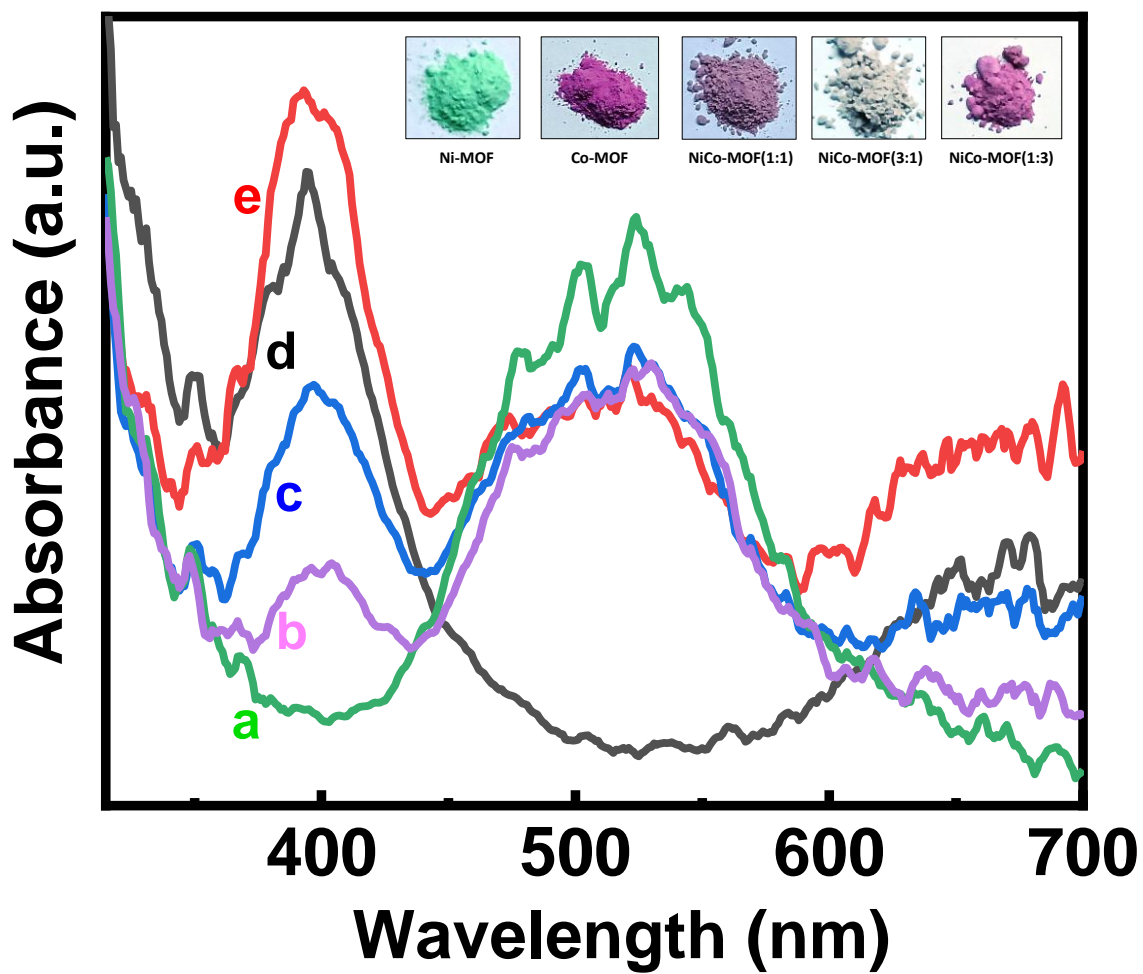
**Fig. S5.** EDAX and mapping of NiCo-MOF (3:1) indicating the presence of expected elements.



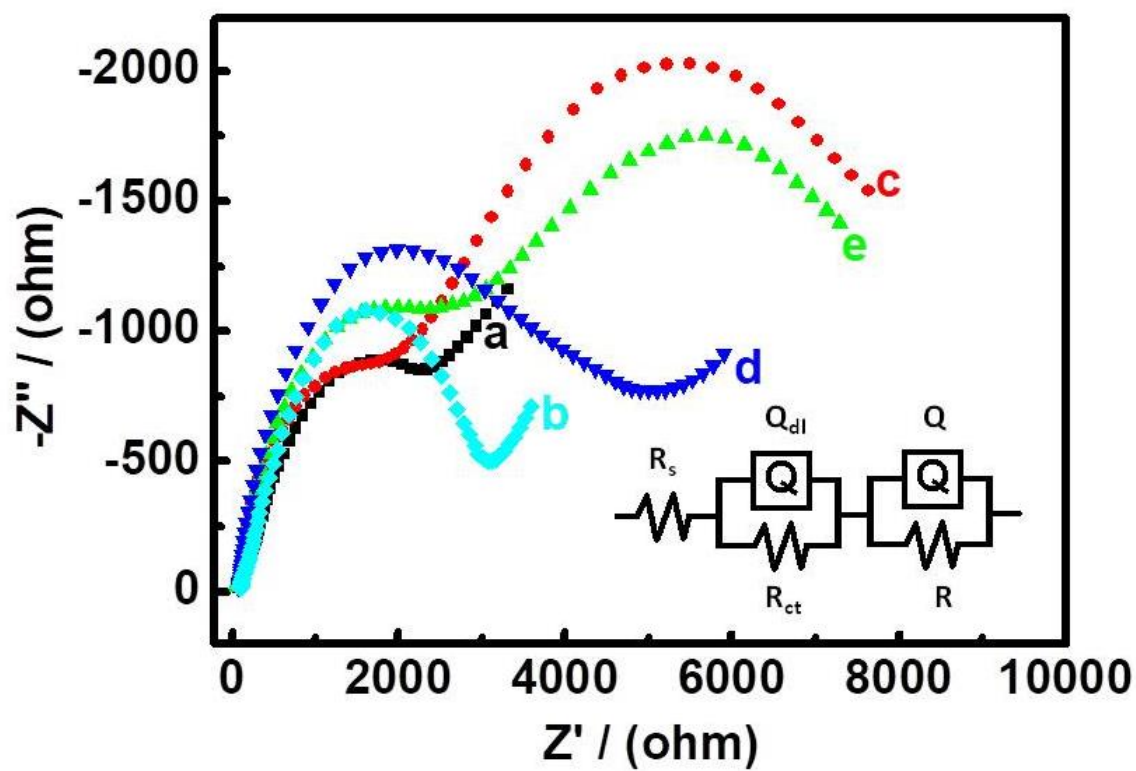
Element	Atomic %	Weight %
Carbon	58.71	40.86
Oxygen	32.90	30.50
Nickel	2.22	7.75
Cobalt	6.17	21.07



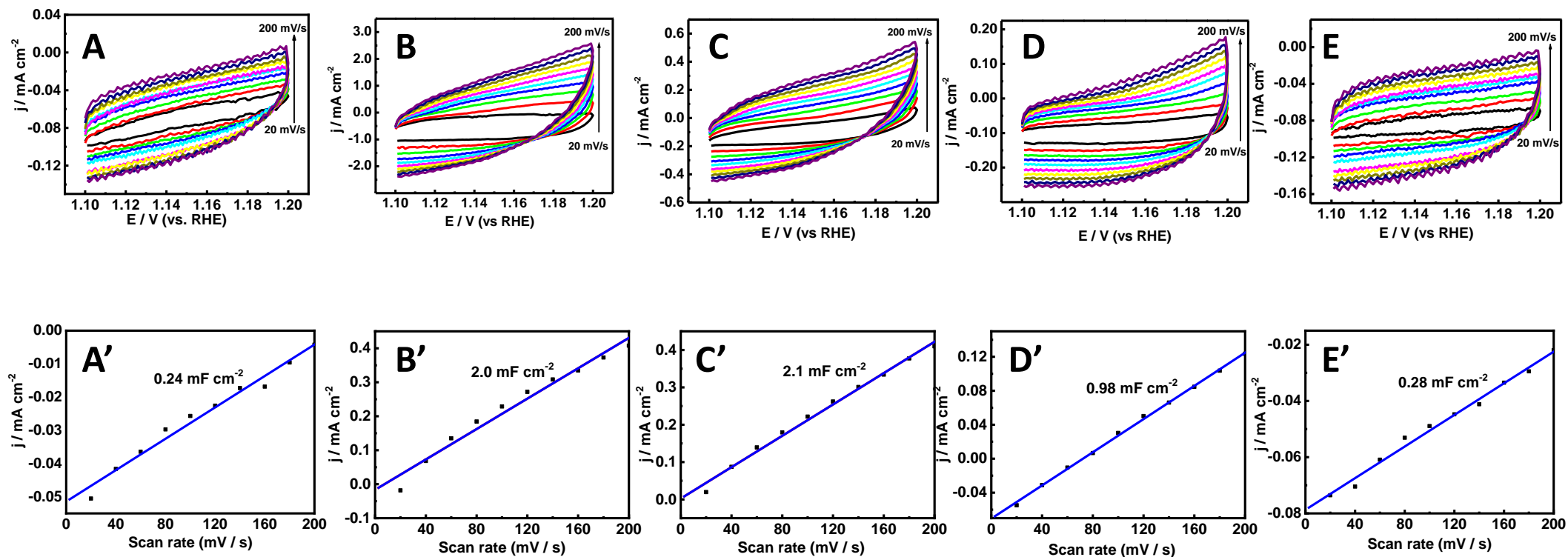
**Fig. S6.** EDAX and mapping of NiCo-MOF (1:3) indicating the presence of expected elements.



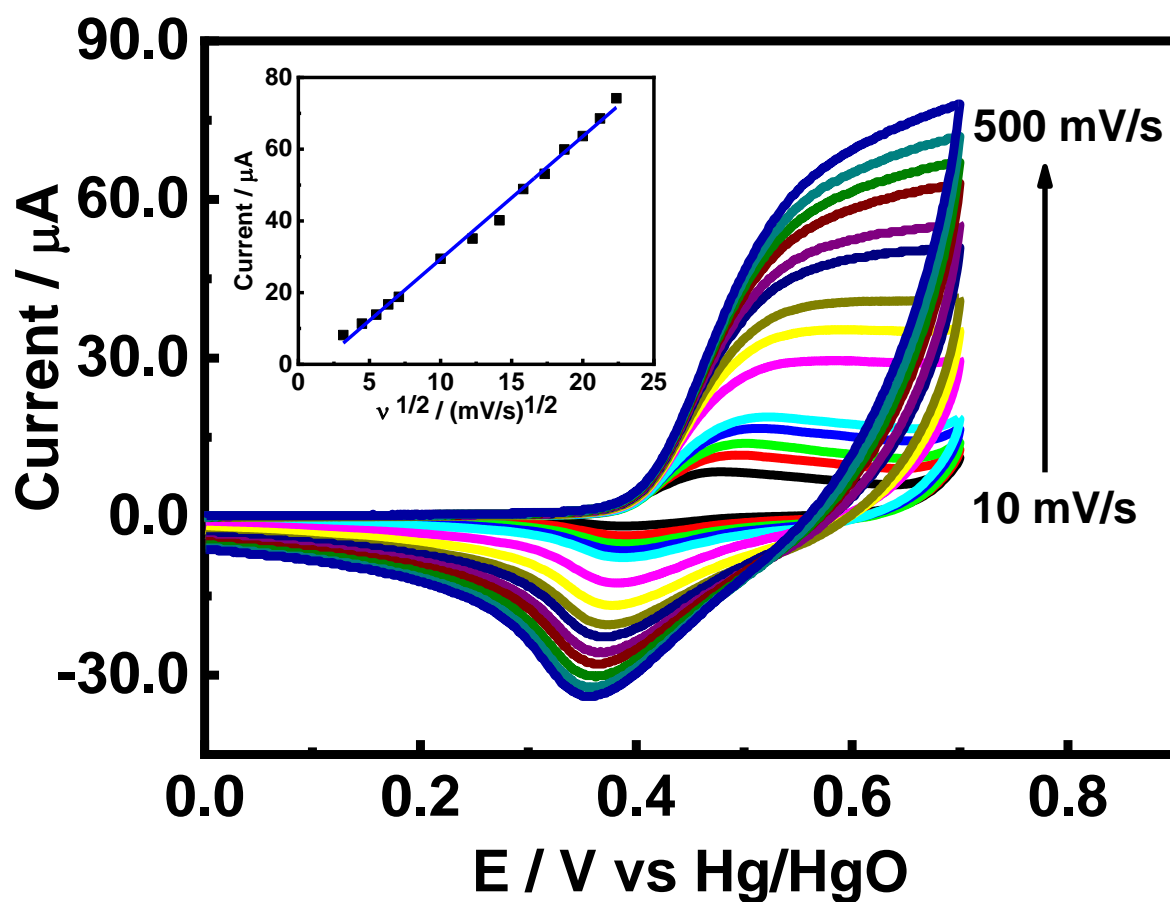
**Fig. S7.** UV-Visible absorption spectra of Co-MOF (a), NiCo-MOF (1:3) (b), NiCo-MOF (1:1) (c), Ni-MOF (d), and NiCo-MOF (3:1) (e). Inset shows the digital photos of different MOF samples.



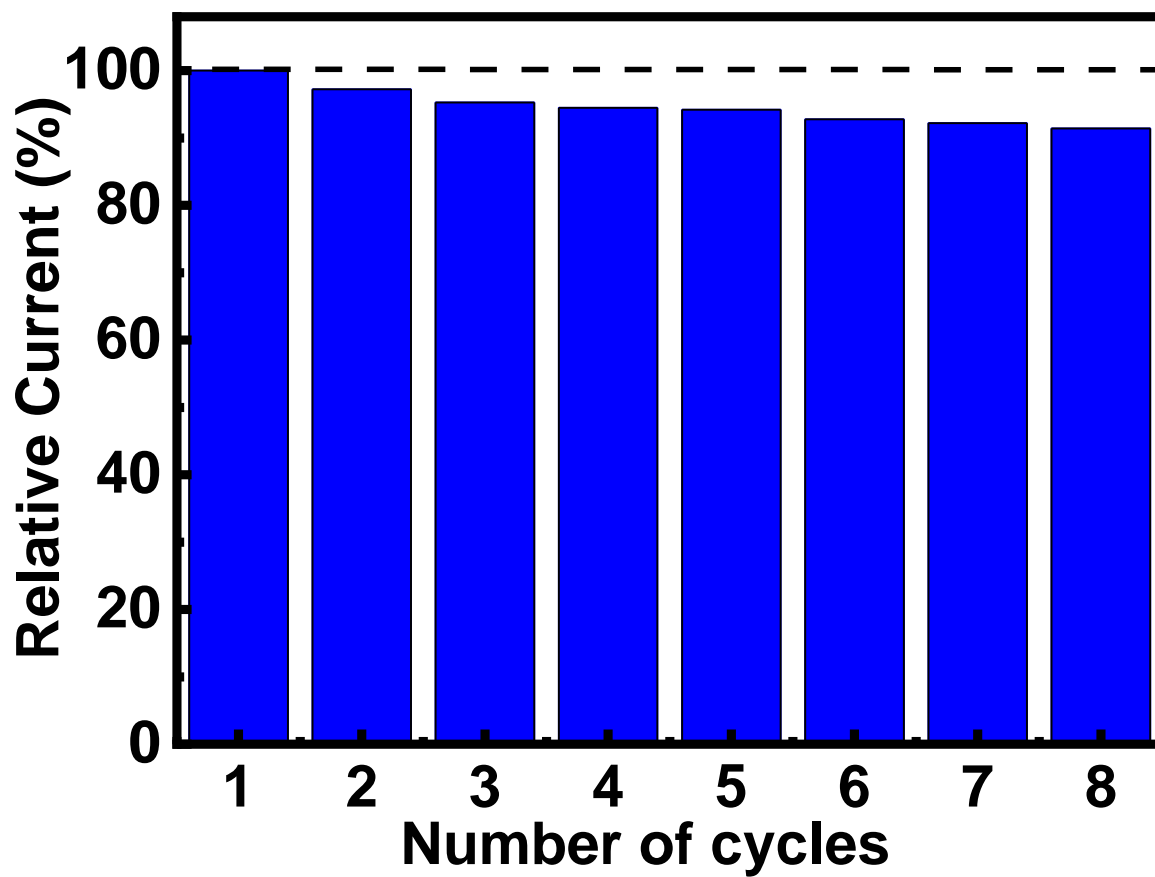
**Fig. S8.** Nyquist plot of Ni-MOF (a), Co-MOF (b), NiCo-MOF (1:1) (c), NiCo-MOF (1:3) (d), and NiCo-MOF (3:1) (e) coated GC. Inset shows the best-fit Randle's -equivalent circuit.



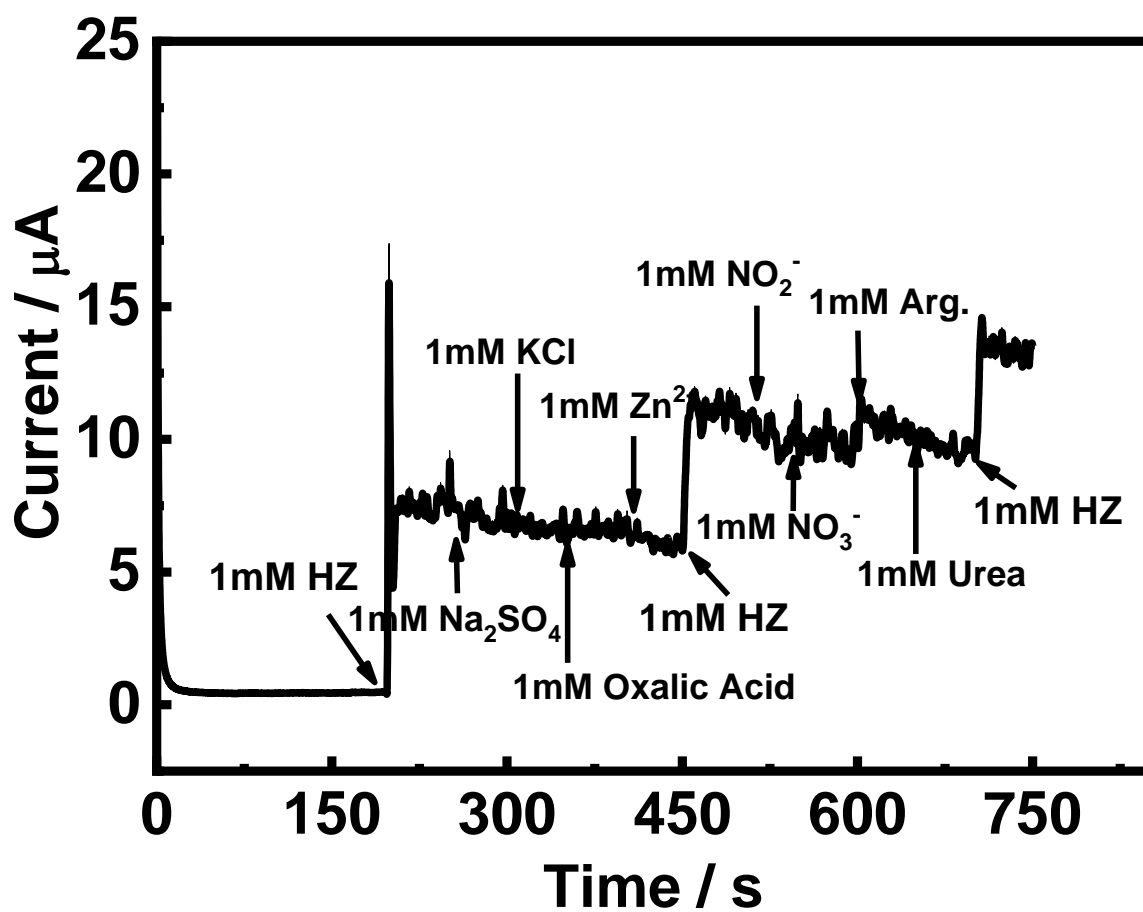
**Fig. S9.** CV responses of Ni-MOF (A), Co-MOF (B), NiCo-MOF (1:1) (C), NiCo-MOF (1:3) (D), and NiCo-MOF (3:1) (E) at different scan rates and their corresponding variation of current density with scan rate (A'-E').



**Fig. S10.** CV curves of 1.0 mM HZ in 0.1 M KOH at different scan rates (10, 20, 30, 40, 50, 100, 150, 200, 250, 300, 350, 400, 450, and 500  $\text{mV s}^{-1}$ ). Inset shows the linear relationship between the current and square root of the scan rate.

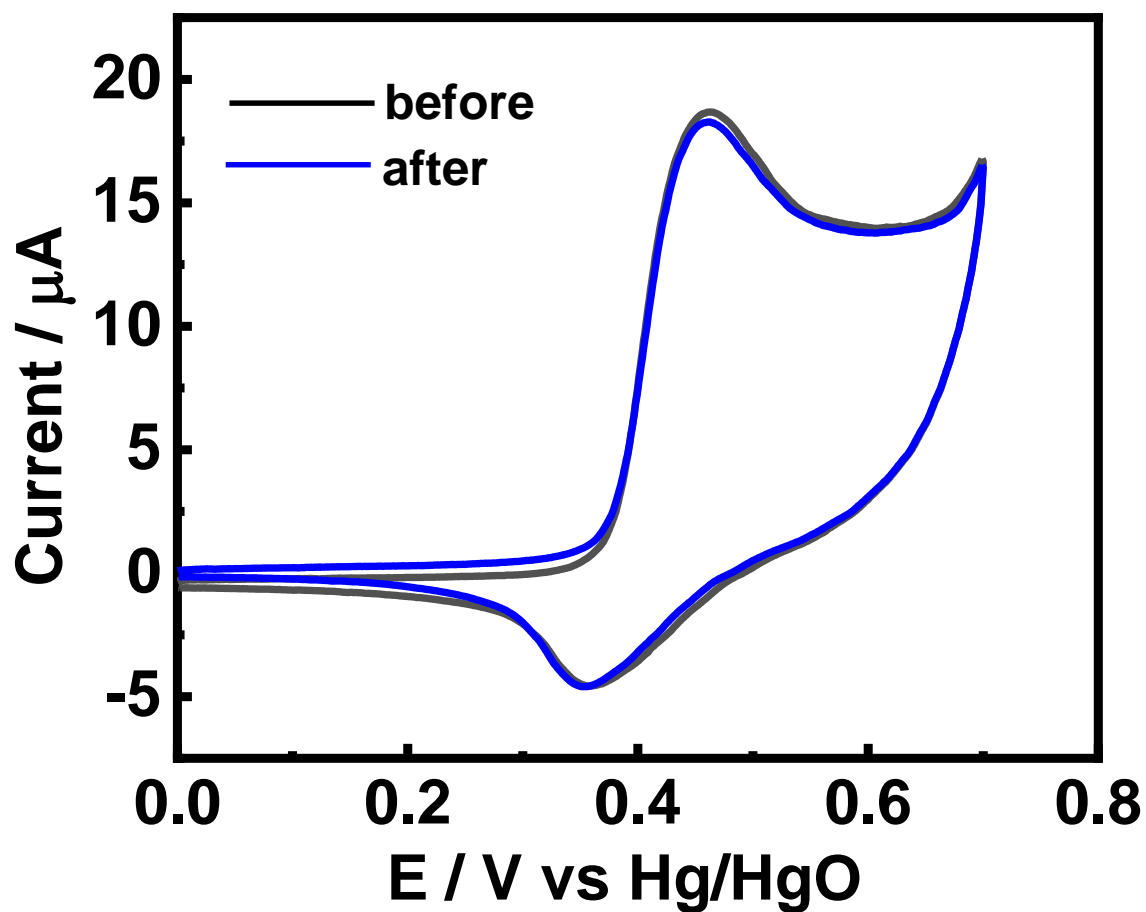


**Fig. S11.** Relative current values at GC/NiCo-MOF (1:1) for the oxidation of 1.0 mM of HZ in 0.1 M KOH

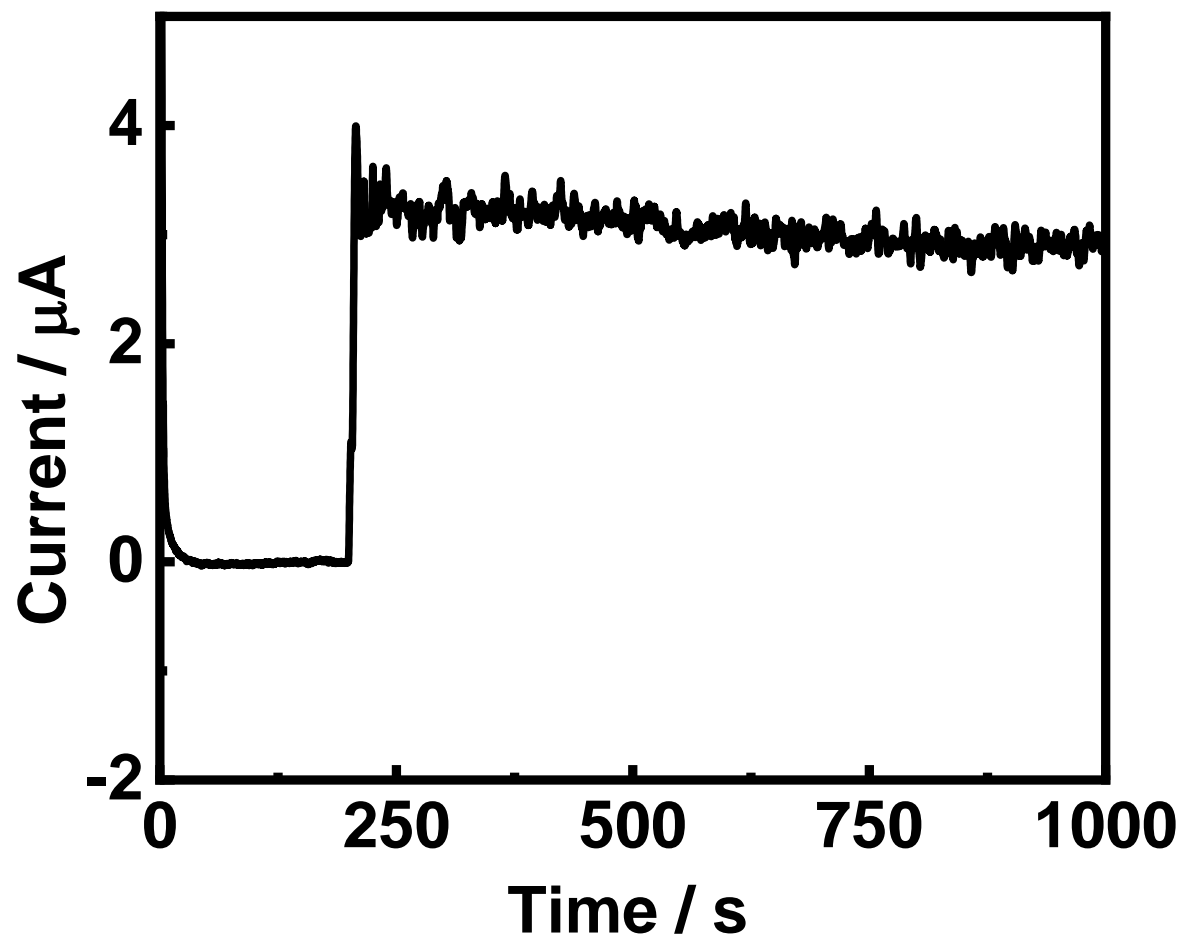


**Fig. S12.** Amperometric plot for interference study of HZ at GC/NiCo-MOF (1:1) in 0.1M KOH showing the selective oxidation of HZ in the presence of other potential interferences at an applied potential of 0.55V





**Fig. S13.** CV response of GC/NiCo-MOF (1:1) before and after 50 continuous CV cycles in the presence of 1.0 mM HZ in 0.1 M KOH.



**Fig. S14.** The amperometric plot of GC/NiCo-MOF (1:1) after addition of 1.0 mM HZ at 200 s in 0.1 M KOH