Supporting Information

Pushing the limits of the layers: Completely delaminated α-$Ni(OH)_2$ – an enhanced electrocatalyst for OER

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Binding Energy (eV)	Oxidation state
855.4	Ni^{2+}
873	Ni^{2+}
857.2	Ni^{3+}
232.4	Mo^{6+}
235.5	Mo^{6+}
231.7	Mo^{5+}
234.8	Mo^{5+}
780.5	Co^{2+}
788.8	Co^{2+}
803.2	Co^{2+}
779.8	Co^{3+}
795.7	Co^{3+}
796.6	Co^{2+}

Table S1 XPS binding energy values

S.No	Catalyst	Overpotential (mV)	Tafel (mV dec-1)	Cdl (mF cm-2)	Stability (h)	Medium	Ref
1	**NMC-6**	**240@η_{10}**	**55**	**14**	**100**	**1M KOH**	**This work**
2	NiFe/NiO	245@η_{10}	25.7	14.54	30	1M KOH	[1]
3	α-LHs	468@η_{10}	138	34.8	22	1M KOH	[2]
4	$Ni(OH)_2$-NP	260@η_{10}	78.6	3.74	10	1M KOH	[3]
5	Fe^{3+} co-decorating $Ni(OH)_2$/NiOOH (Pi-Fe:NiOH)	118@η_{10}	52	34.2	500	1M KOH	[4]
6	$LaFe_{0.8}Co_{0.2}O_3/Ni(OH)_2$	329@η_{10}	95	7.055	24	1M KOH	[5]
7	$Ni(OH)_2$/NF	172@η_{10}	150	71	24	1M KOH	[6]
8	$Ni/Ni(OH)_2$	400@η_{10}	85	-	32	1M KOH	[7]
9	NiCoFe LDH/MoO_3	270@η_{10}	73	0.46	70	1M KOH	[8]
10	FeCoNi-MoO_4	204@η_{10}	50.6	43.8	48	1M KOH	[9]
11	NiMo-Fe	217@η_{10}	30.05	-	200	1M KOH	[10]

Table S2 Literature comparison of NMC-6

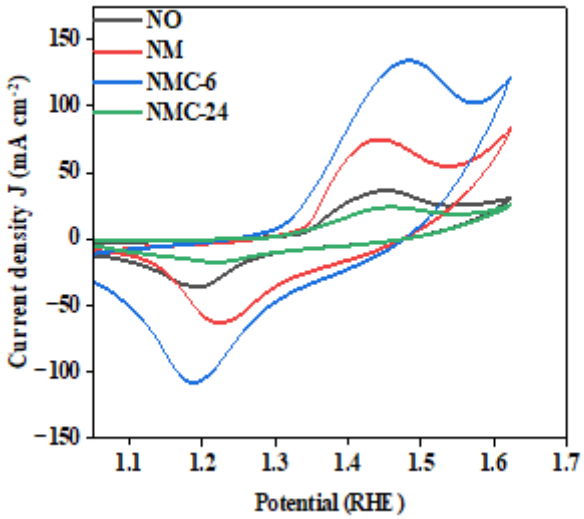


Figure S1 CV of as-synthesized compounds at a scan rate of 5 mV s^{-1}

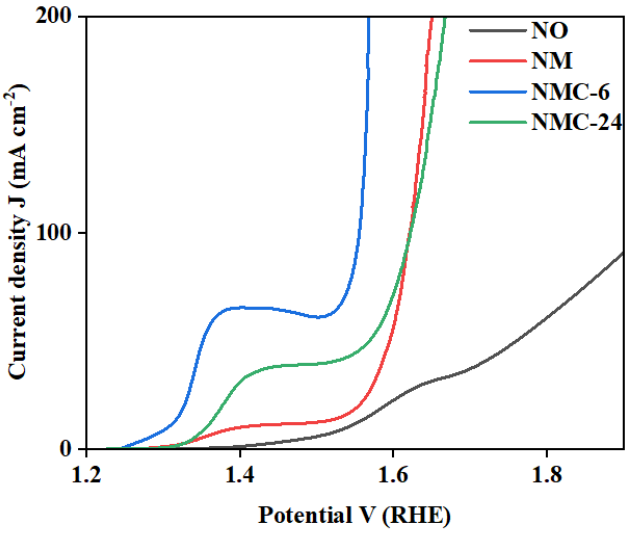


Figure S2 Forward LSV of as-synthesized compounds at a scan rate of 5 mV s^{-1}

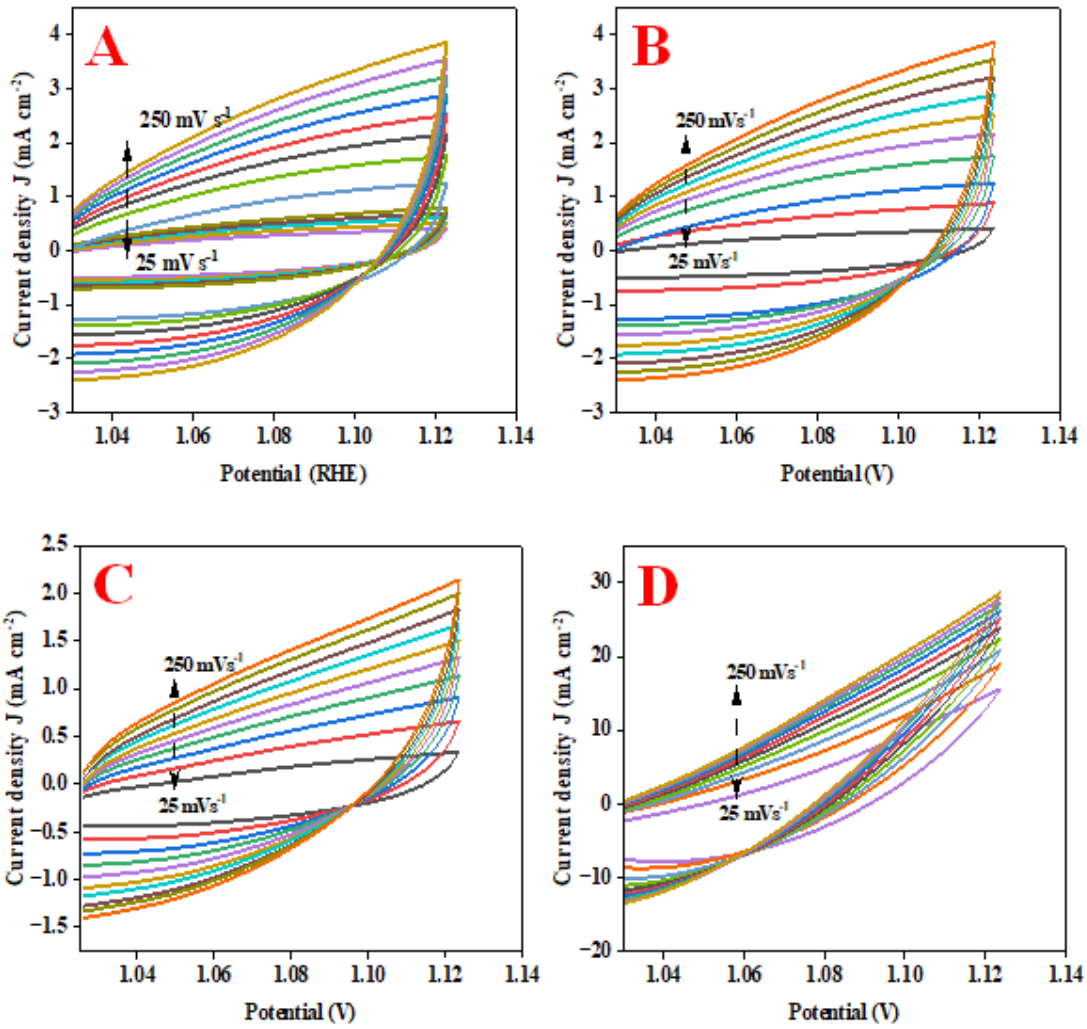
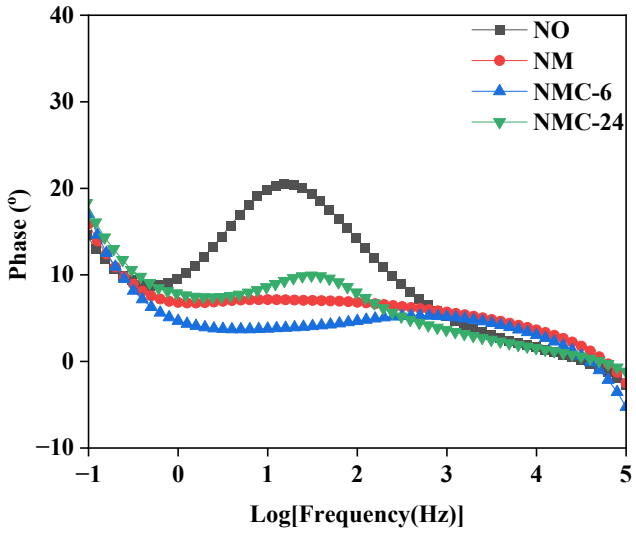
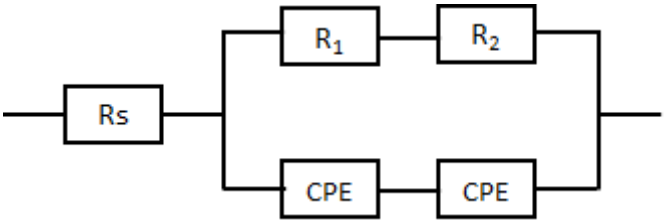


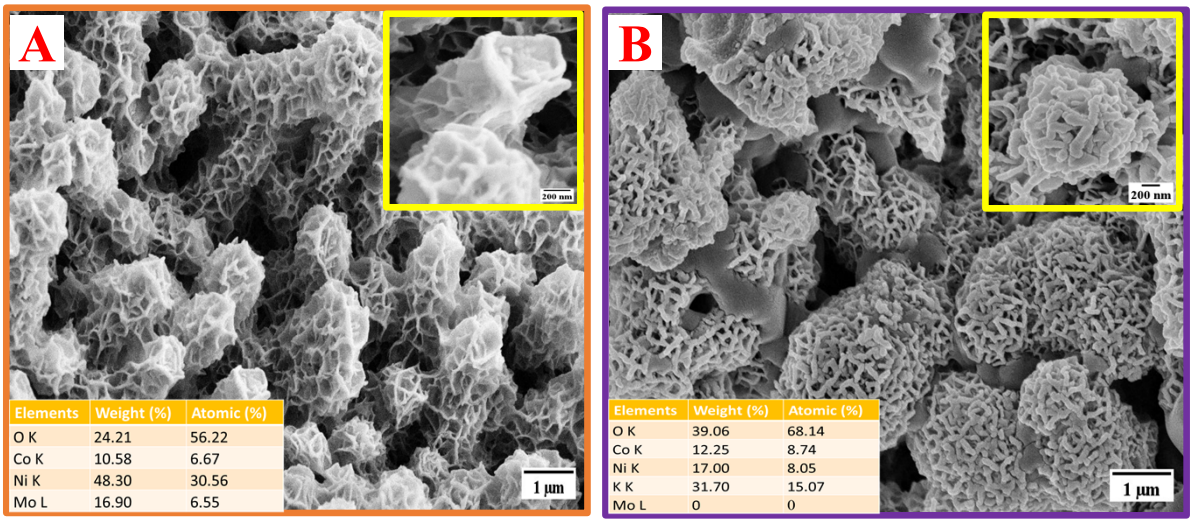
Figure S3 CV at different scan rate under non-faradic region





Samples	R_s	R_{ct}
NO	1.83	4.5
NM	1.33	1.3
NMC-6	0.313	0.5
NMC-24	0.789	1.9

Figure S4 Bode diagram and Nyquist plot circuit diagram representation of as-synthesized compounds



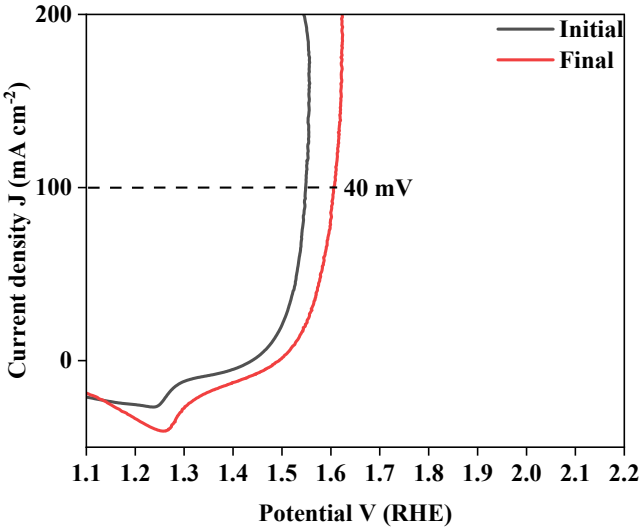


Figure S5 Before (A) and after(B) FESEM and backward LSV image of NMC-6 @ 100 mA cm^{-2}

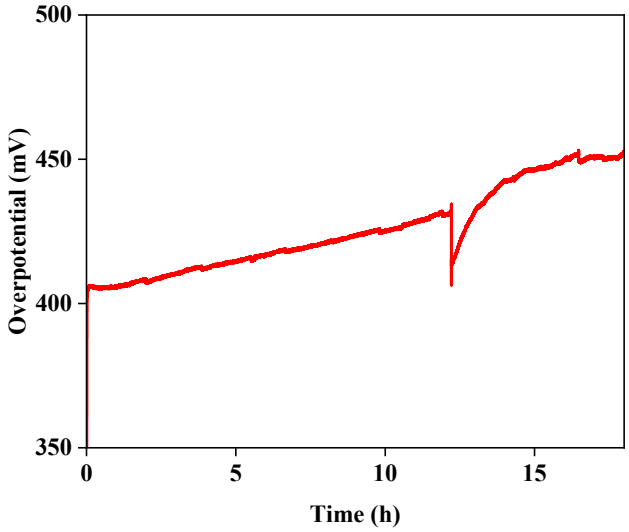


Figure S6 Chrono potentiometry study of NM @ 100 mA cm^{-2}

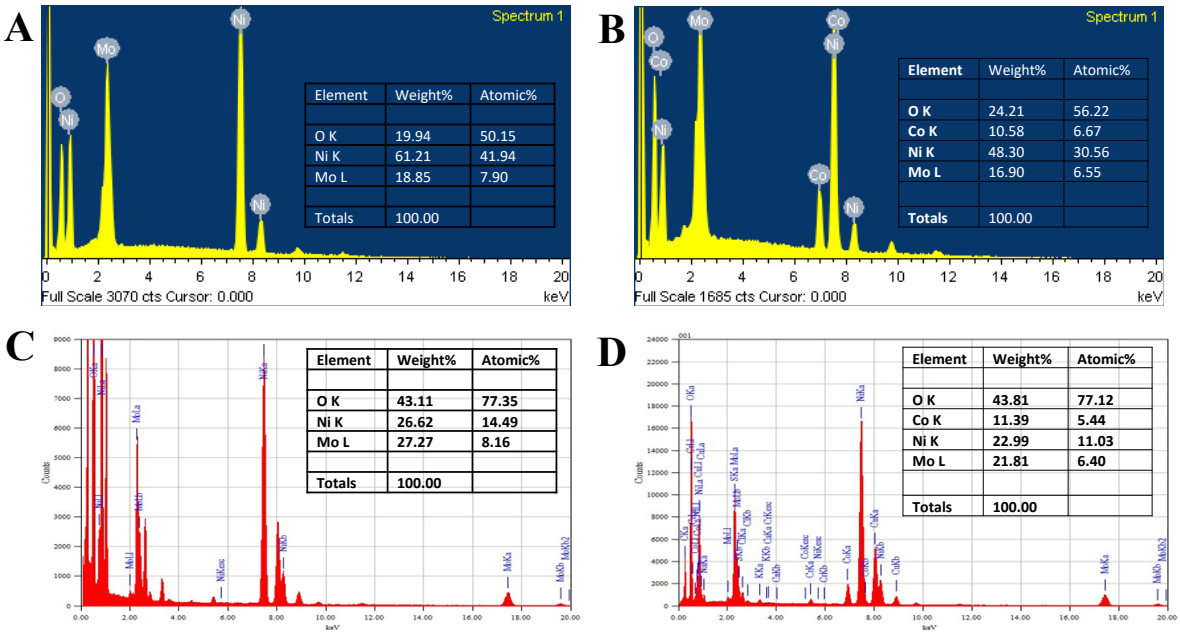


Figure S7 Quantitative results of elemental distribution of sample NM, from FESEM (Figure A) and TEM (Figure C); elemental distribution for sample NMC-6, from FESEM (Figure B) and TEM (Figure D) measurements

Reference

1 Jeon JH, Kim JE, Kim TH, Park CS, Jung K, Yoon J, Kim J, Kim YH, Kang KS, *Electrochemistry Communications,* 2024,**160**, 107668.

2 Sanchis-Gual R, Jaramillo-Hernández C, Hunt D, Seijas-Da Silva Á, Mizrahi M, Marini C, Oestreicher V, Abellán G, *Chemistry–A European Journal,* 2024, **30(5)**, e202303146.

3 C. Luan, G. Liu, Y. Liu, L. Yu, Y. Wang, Y. Xiao, H. Qiao, X. Dai and X. Zhang, *ACS Nano*, 2018, **12**, 3875–3885.

4 Y. Li, J. Liu, S. Li and S. Peng, *ACS Catalysis*, 2024, **14**, 4807–4819.

5 D. Kubba, I. Ahmed, A. Roy, P. Kour, C. S. Yadav, S. K. Sharma, K. Yadav and K. K. Haldar, ACS *Appl Nano Mater*, 2024, **7**, 1536–1547.

6 Y. Rao, Y. Wang, H. Ning, P. Li and M. Wu, *ACS Appl Mater Interfaces*, 2016, **8**, 33601–33607.

7 P. Pathmanathan, A. Gomathi, A. Ramesh and C. Subrahmanyam, *RSC Adv*, 2024, **14**, 21808–21820.

8 C. Dong, M. Guo, W. Gao, P. Hao, F. Lei, J. Xie and B. Tang, *J Colloid Interface Sci*, 2022, **627**, 891–899.

9 W. Fan, C. Liu, H. Wang, J. Wu, S. Chen, W. Fang, C. Wu, Y. Quan, D. Wang and Y. Qi, *J Colloid Interface Sci*, 2024, **662**, 460–470.

10 Liao H, Zhang X, Niu S, Tan P, Chen K, Liu Y, Wang G, Liu M, Pan J*, Applied Catalysis B: Environment and Energy*, 2022, **307**, 121150.