

Supplementary Information

Solution Combustion Synthesis of Ni-based Hybrid Metal Oxides for Oxygen Evolution Reaction in Alkaline Medium

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Table 1S. Area ratio of deconvoluted XPS spectra of Ni³⁺/Ni²⁺ and M^{n+m}/Mⁿ⁺ NiO and the hybrid binary Ni_xM_{1-x}O_y materials

Catalyst	Area Ratio of Ni ³⁺ /Ni ²⁺	Area Ratio of M ^{n+m} / M ⁿ⁺
NiO	0.75	-
Ni_xCo_{1-x}O_y	1.00	1.51
Ni _x Fe _{1-x} O _y	0.88	0.81
Ni _x Mn _{1-x} O _y	0.77	0.65
Ni _x Mo _{1-x} O _y	0.92	0.87
Ni _x Cu _{1-x} O _y	0.82	0.67
Ni _x Cr _{1-x} O _y	0.85	0.71

Fig S1. EDX analysis of (a) NiO, (b) Ni_xCo_{1-x}O_y, (c) Ni_xFe_{1-x}O_y, (d) Ni_xMn_{1-x}O_y, (e) Ni_xMo_{1-x}O_y, (f) Ni_xCu_{1-x}O_y and (g) Ni_xCr_{1-x}O_y.

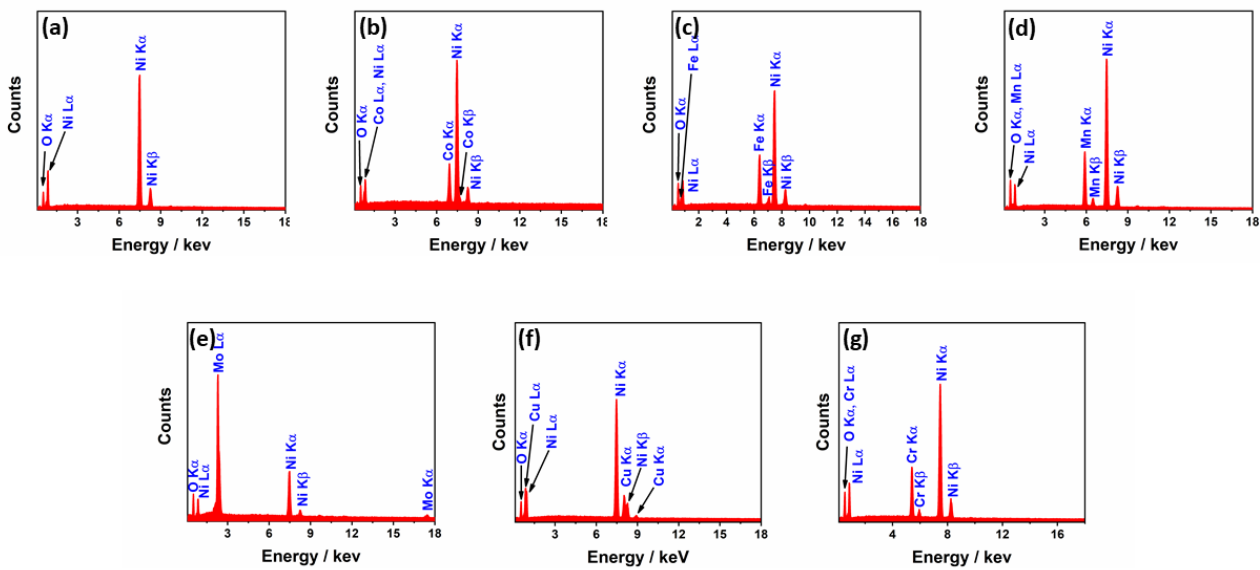


Fig. S2 Pore size distribution of (a) NiO, (b) Ni_xCo_{1-x}O_y, (c) Ni_xFe_{1-x}O_y, (d) Ni_xMn_{1-x}O_y, (e) Ni_xMo_{1-x}O_y, (f) Ni_xCu_{1-x}O_y and (g) Ni_xCr_{1-x}O_y.

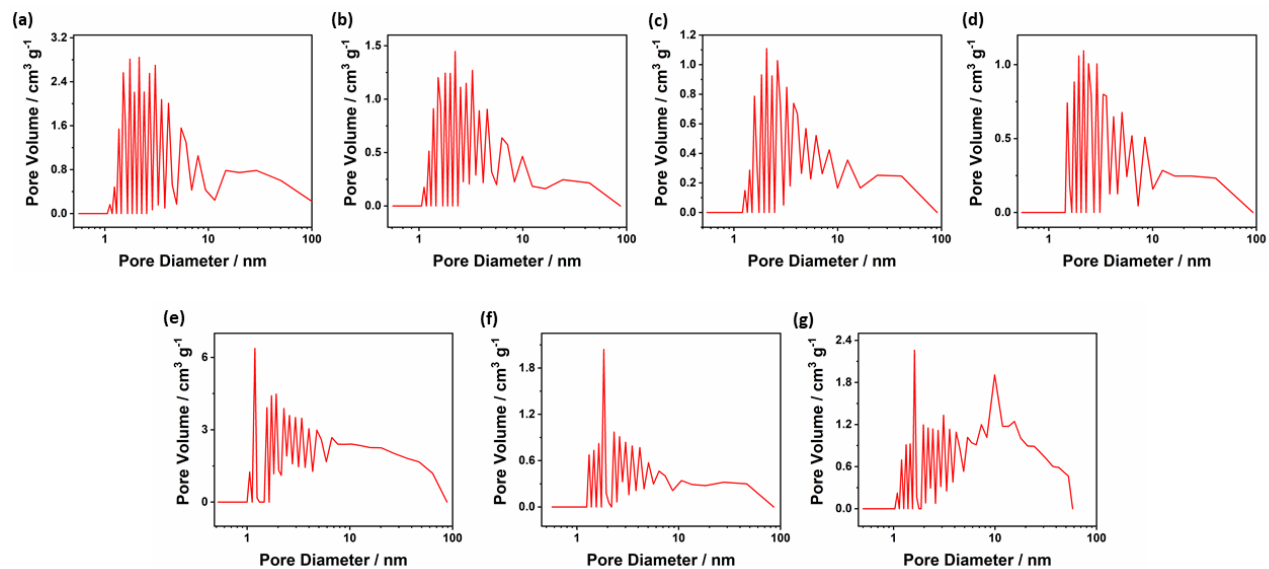


Fig. S3 XRD pattern of NiO

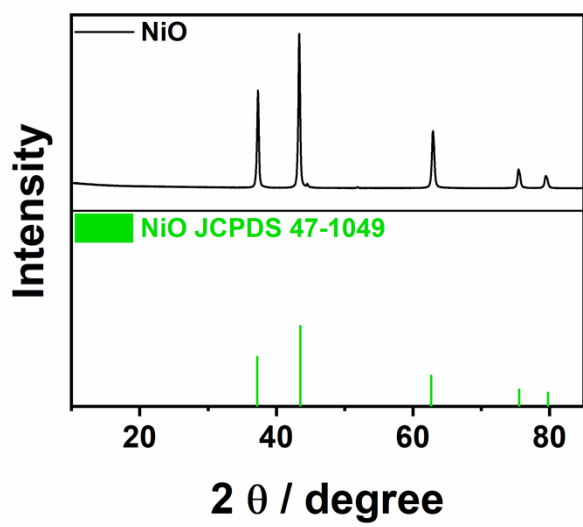


Fig. S4 XRD pattern of $\text{Ni}_x\text{Co}_{1-x}\text{O}_y$

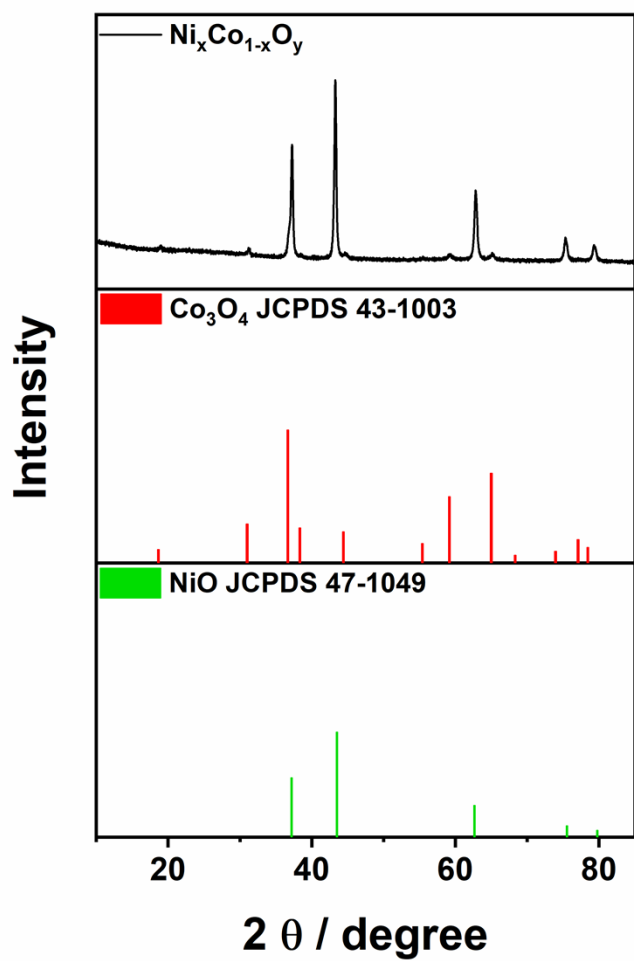


Fig. S5 XRD pattern of $\text{Ni}_x\text{Fe}_{1-x}\text{O}_y$

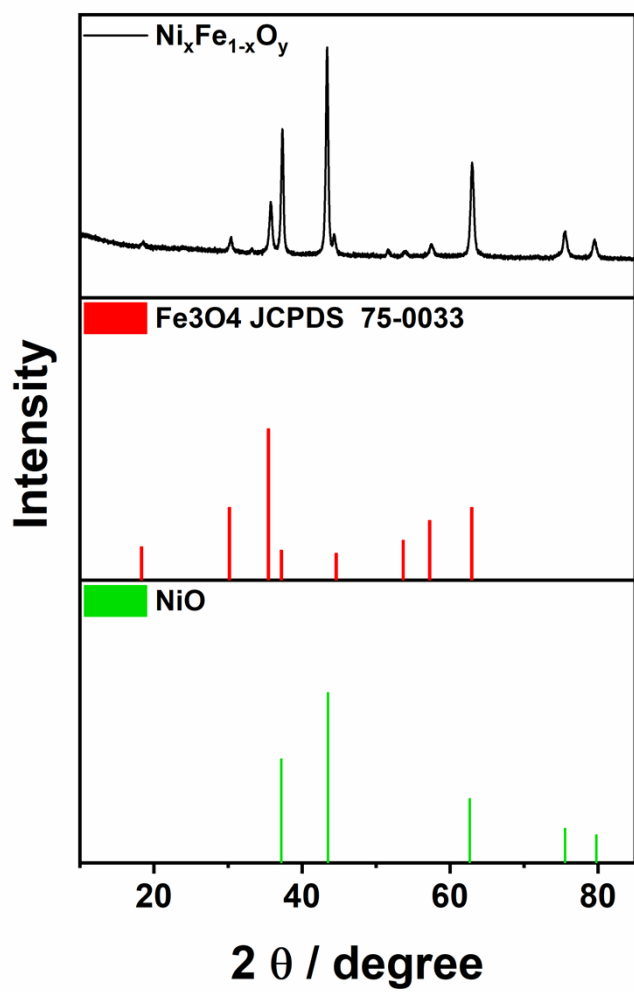


Fig. S6 XRD pattern of $\text{Ni}_x\text{Mn}_{1-x}\text{O}_y$

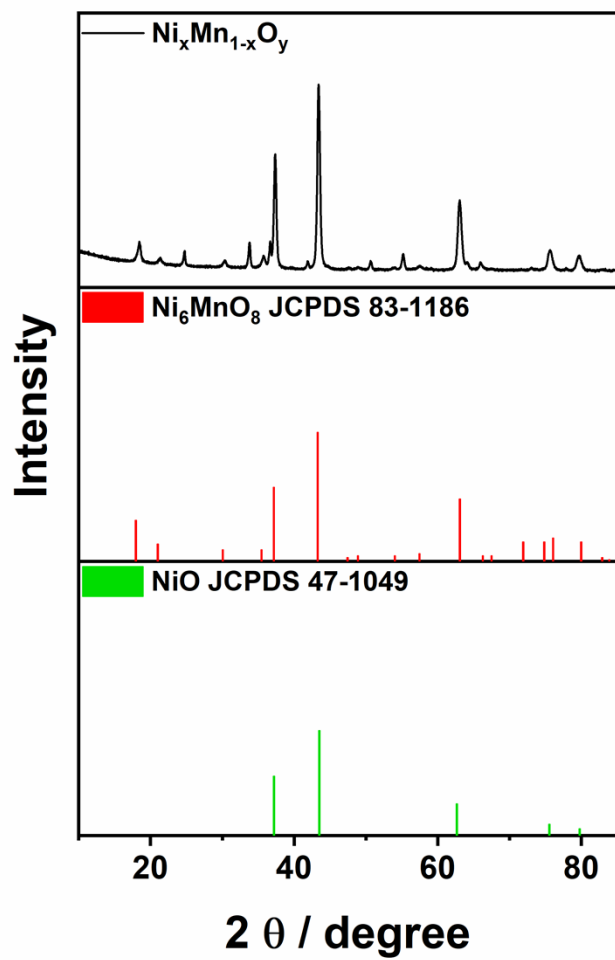


Fig. S7 XRD pattern of $\text{Ni}_x\text{Mo}_{1-x}\text{O}_y$

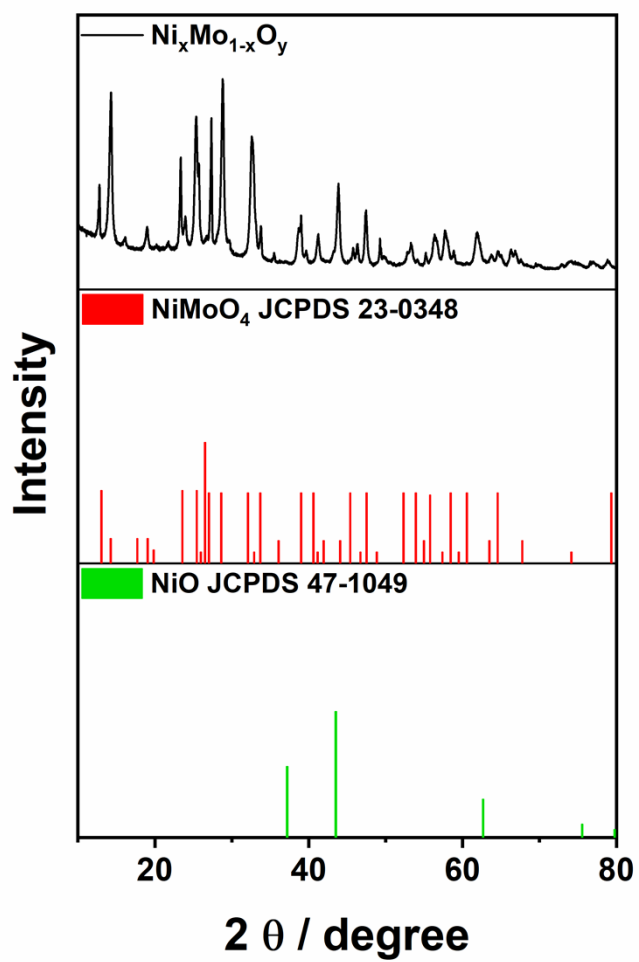


Fig. S8 XRD pattern of $\text{Ni}_x\text{Cu}_{1-x}\text{O}_y$

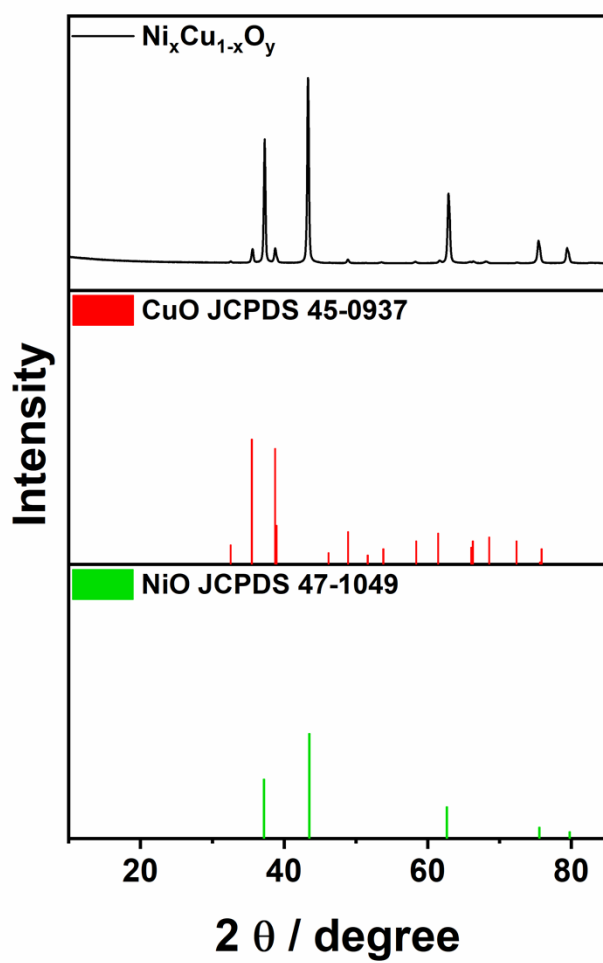


Fig. S9 XRD pattern of $\text{Ni}_x\text{Cr}_{1-x}\text{O}_y$

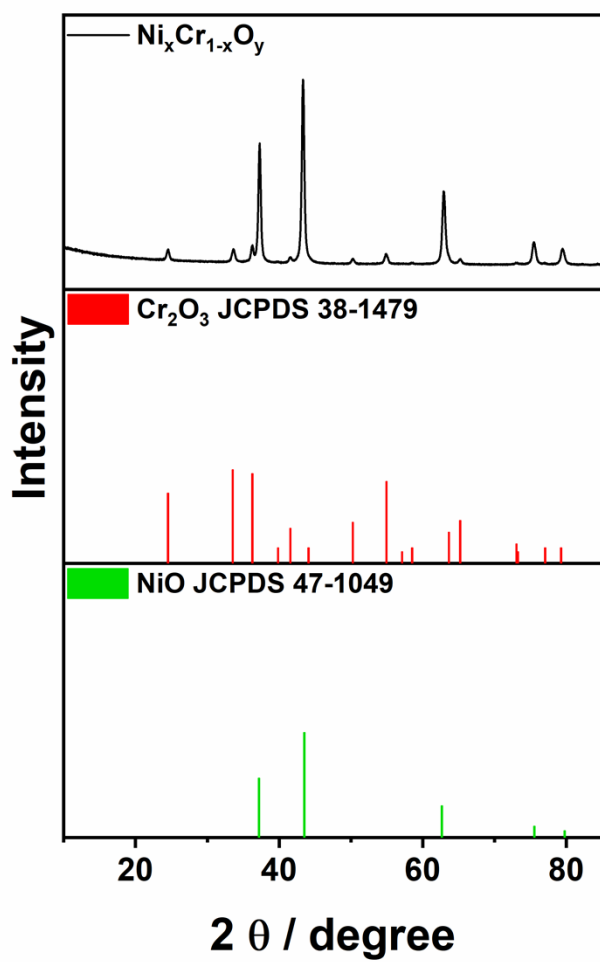


Fig. S10 Detailed XPS survey spectra of (a) NiO, (b) Ni_xCo_{1-x}O_y, (c) Ni_xFe_{1-x}O_y, (d) Ni_xMn_{1-x}O_y, (e) Ni_xMo_{1-x}O_y, (f) Ni_xCu_{1-x}O_y and (g) Ni_xCr_{1-x}O_y.

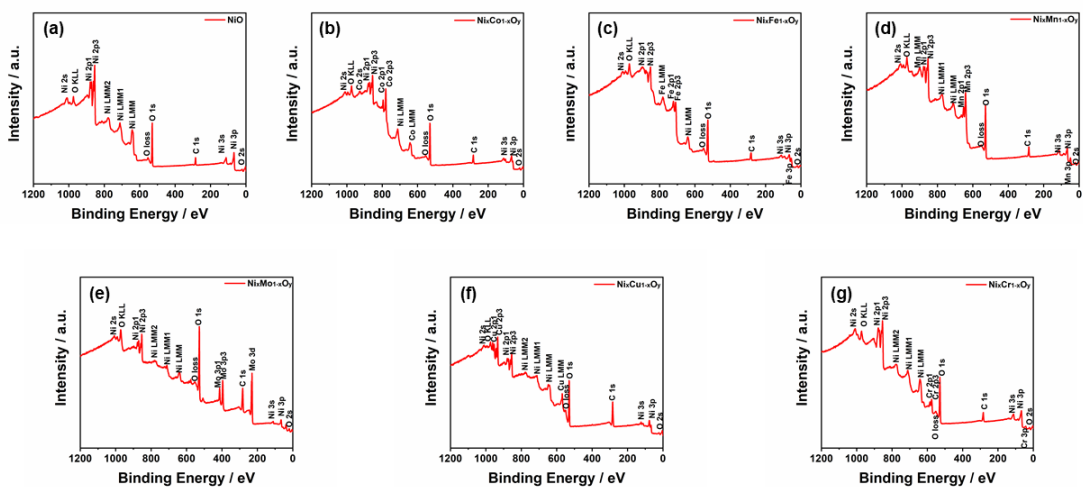


Fig. S11 O1S spectrum for (a) NiO, (b) Ni_xCo_{1-x}O_y, (c) Ni_xFe_{1-x}O_y, (d) Ni_xMn_{1-x}O_y, (e) Ni_xMo_{1-x}O_y, (f) Ni_xCu_{1-x}O_y and (g) Ni_xCr_{1-x}O_y.

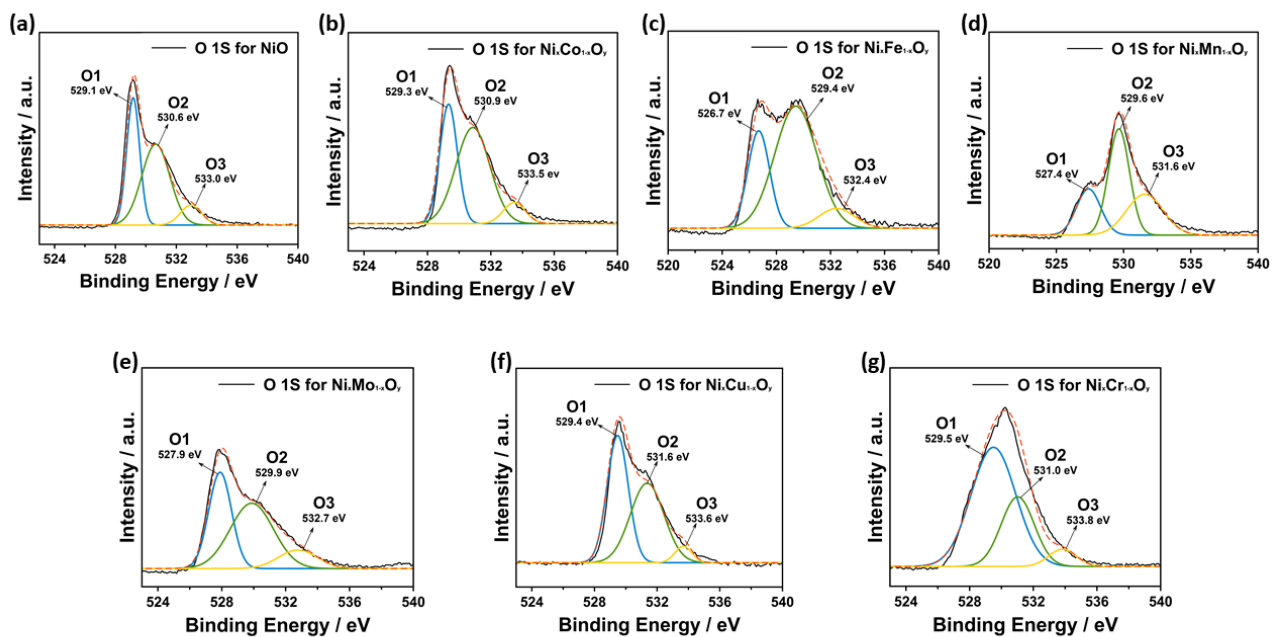


Fig. S12 XRD pattern of NiO after activity

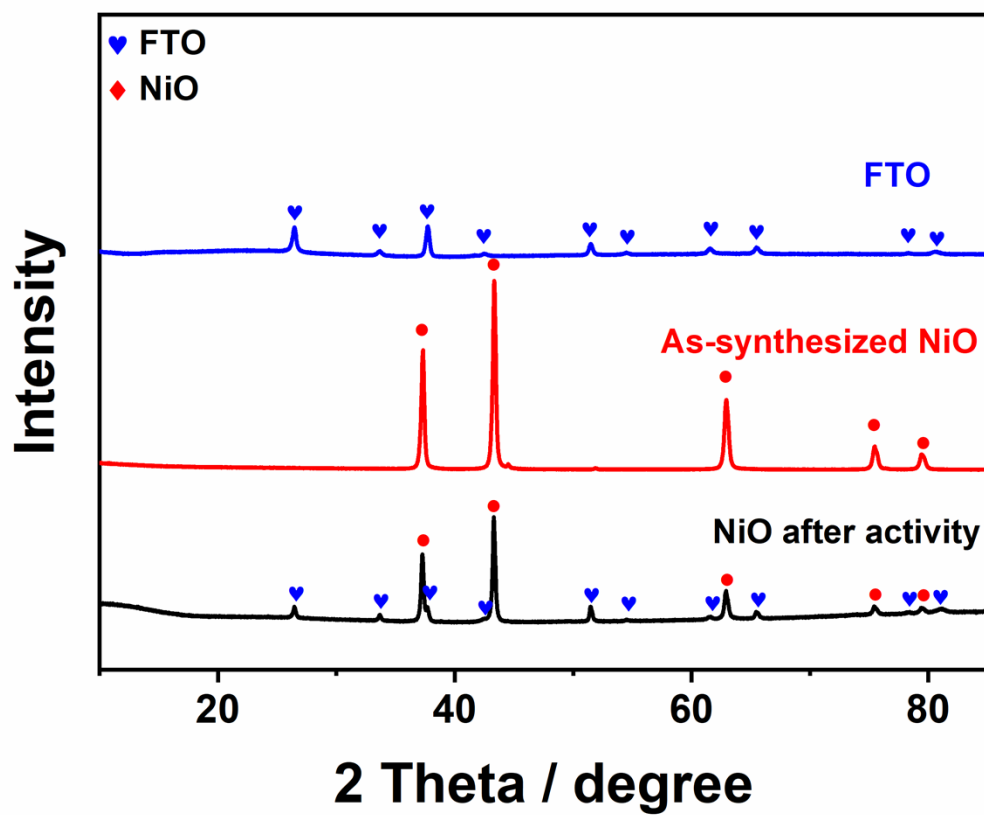


Fig. S13 XRD pattern of $\text{Ni}_x\text{Co}_{1-x}\text{O}_y$ after activity

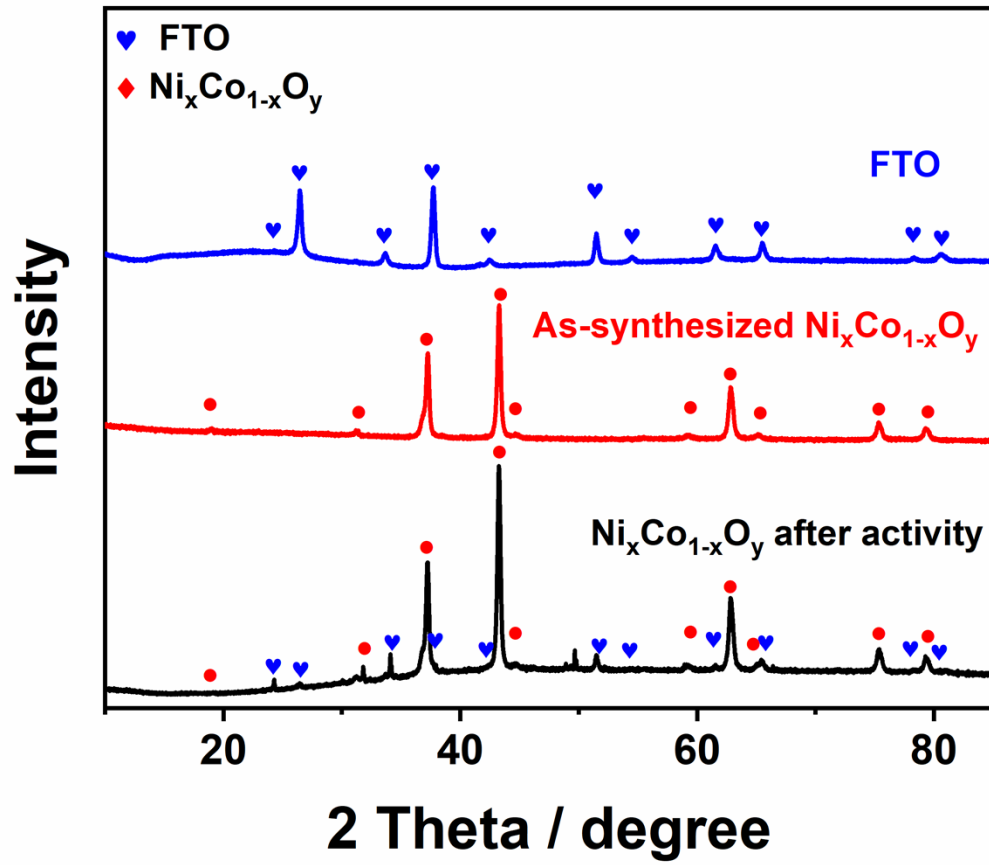


Fig. S14 XRD pattern of $\text{Ni}_x\text{Fe}_{1-x}\text{O}_y$ after activity

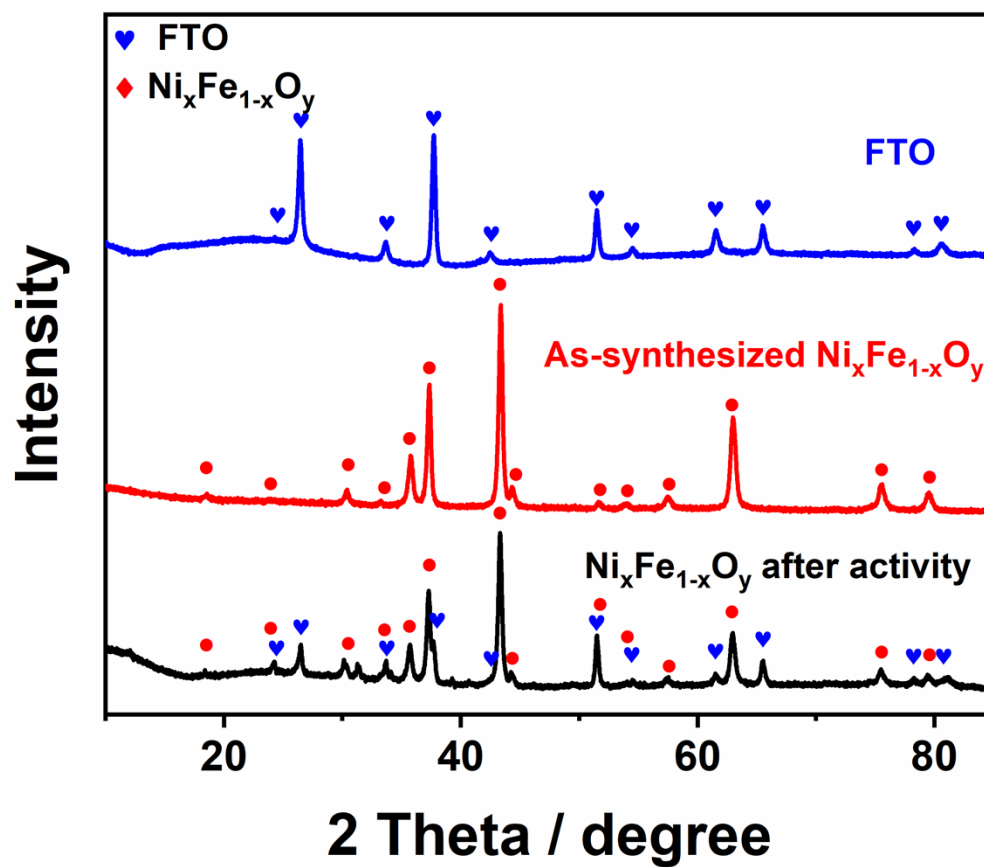


Fig. S15 XRD pattern of $\text{Ni}_x\text{Mn}_{1-x}\text{O}_y$ after activity

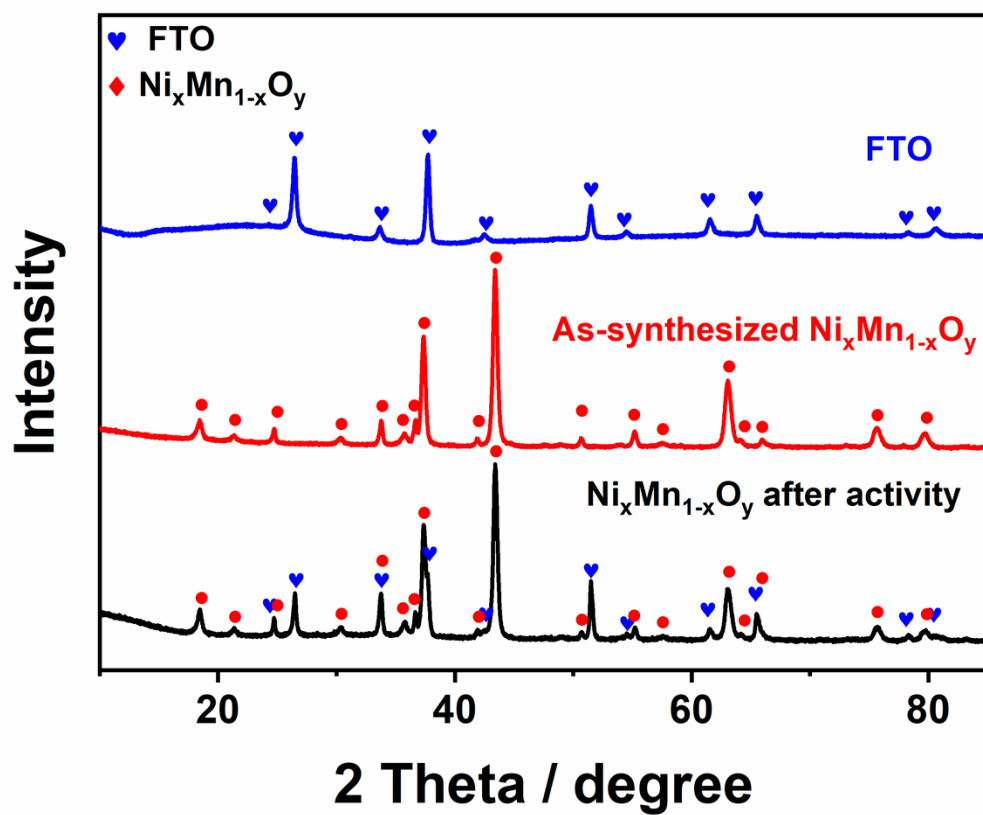


Fig. S16 XRD pattern of $\text{Ni}_x\text{Mo}_{1-x}\text{O}_y$ after activity

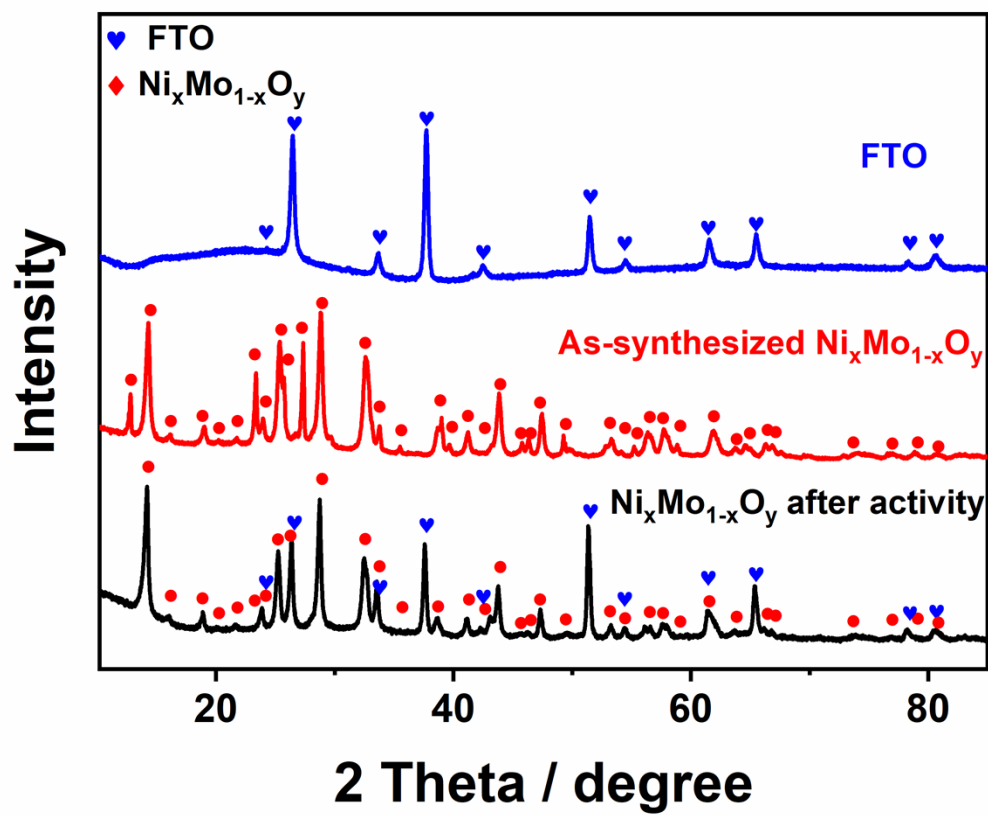


Fig. S17 XRD pattern of $\text{Ni}_x\text{Cu}_{1-x}\text{O}_y$ after activity

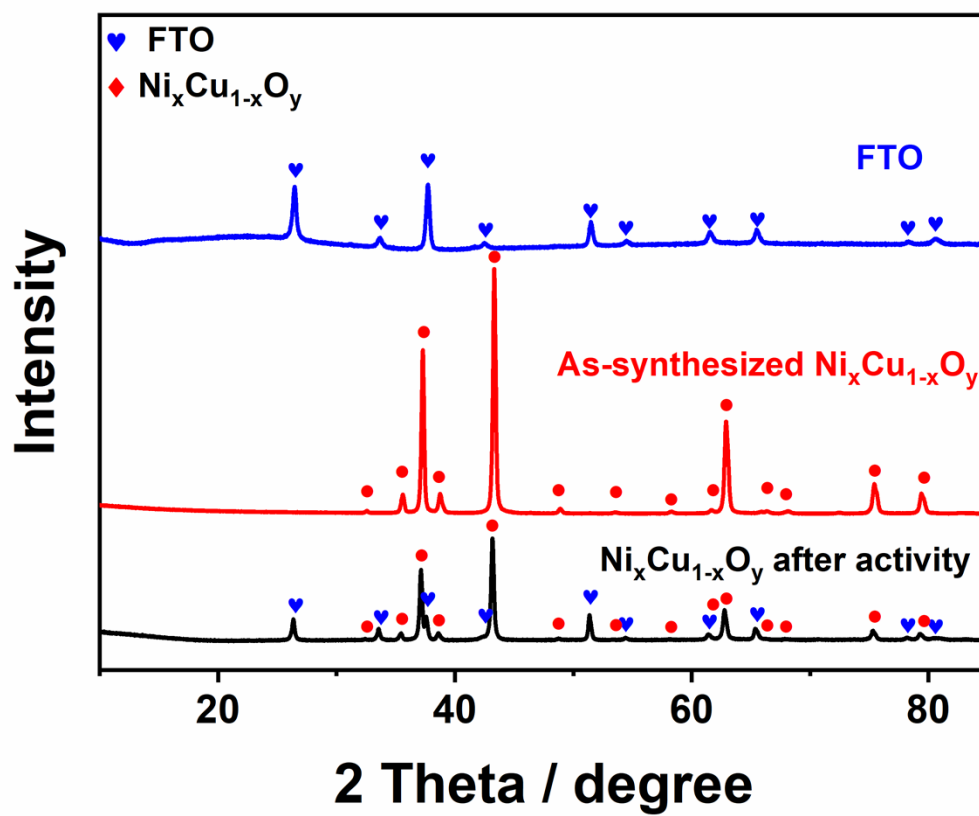


Fig. S18 XRD pattern of $\text{Ni}_x\text{Cr}_{1-x}\text{O}_y$ after activity

