3D hierarchical Co_3O_4@Co_3S_4 nanoarrays as anode and cathode materials for oxygen evolution reaction and hydrogen evolution reaction

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Preparation of RuO_2

The RuO_2 catalyst was prepared as follows. In brief, 0.01 mol of $RuCl_3.3H_2O$ was dissolved in 100 mL deionized water and heated under air atmosphere at 100°C for 10 min, followed by the addition of 1mL KOH solution (1.0 M). The reaction mixture was maintained at this temperature under stirring for 45 min. After that, the solution was centrifuged for 10 minutes and filtered. The precipitate was washed several times with deionized water to remove the remaining chlorides. The resulting Ruhydroxide was dried for 5 h at 80 °C and then calcined in air at 300 °C for 3 h to obtain RuO_2.

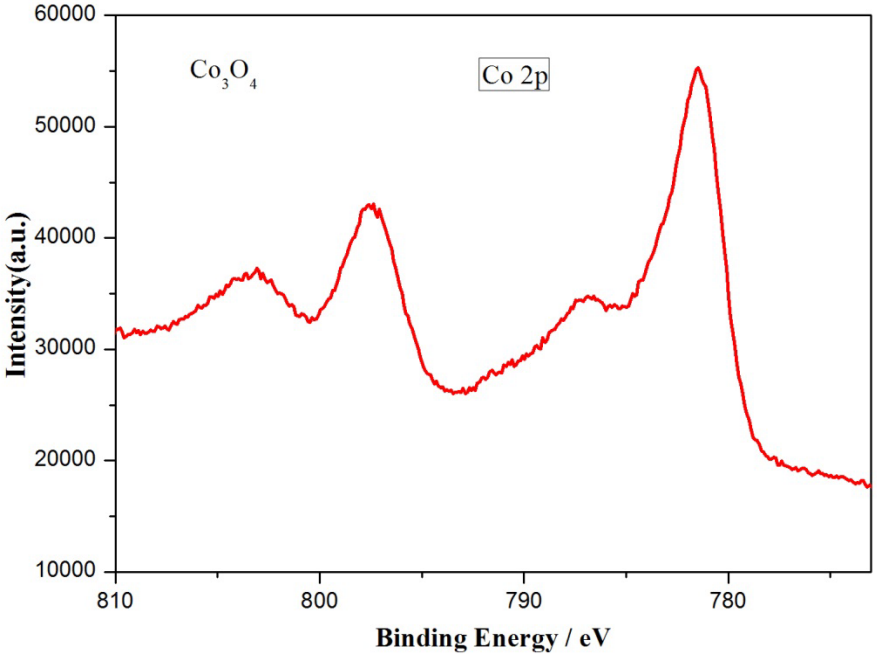

Fig. S1XPS spectra of the Co 2p for Co_3O_4 /NF.

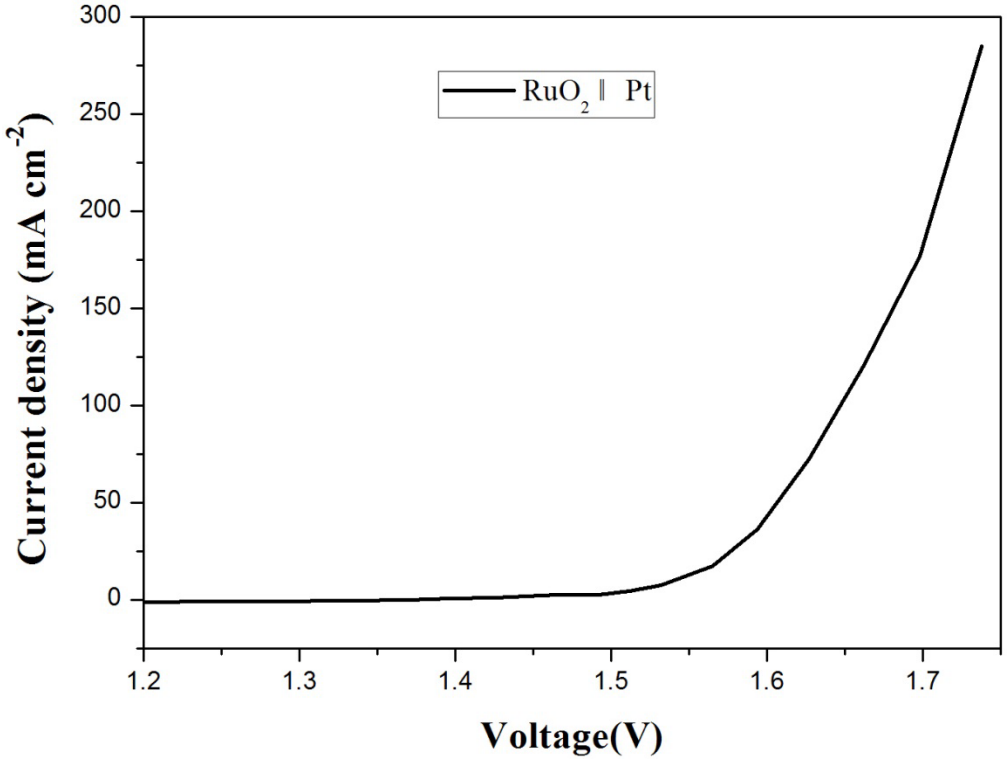

Fig. S2 Polarization curve of the RuO_2 and Pt for water splitting with a scan rate of 5 mV s^{-1} in 1 M KOH.

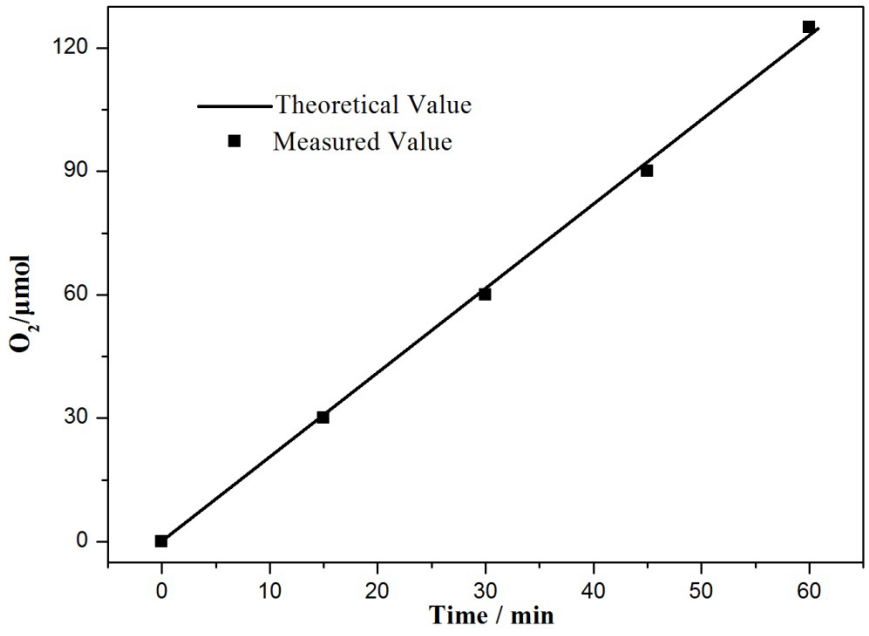

Fig. S3 Electrocatalytic efficiency of O_2 production over Co_3O_4@Co_3S_4/NF-24h at a potential of ca. 1.4V, measured for 60 min.

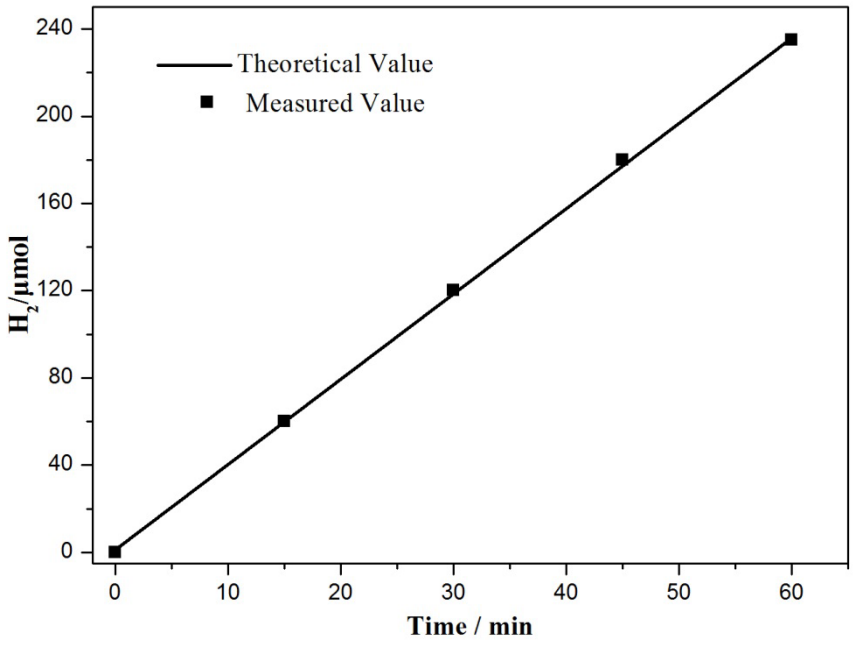

Fig. S4 Electrocatalytic efficiency of H_2 production over Co_3O_4@Co_3S_4/NF-24h at a potential of ca. -0.2V, measured for 60 min.

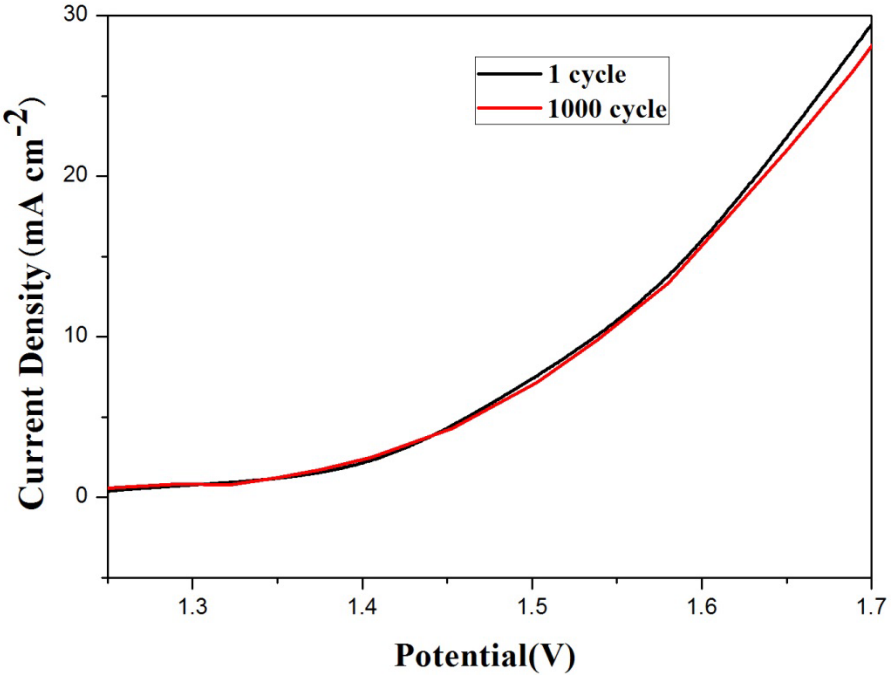

Fig. S5 The water splitting polarization curves for the Co_3O_4@Co_3S_4/NF-24h before and after 1000 cycles of the accelerated stability test.

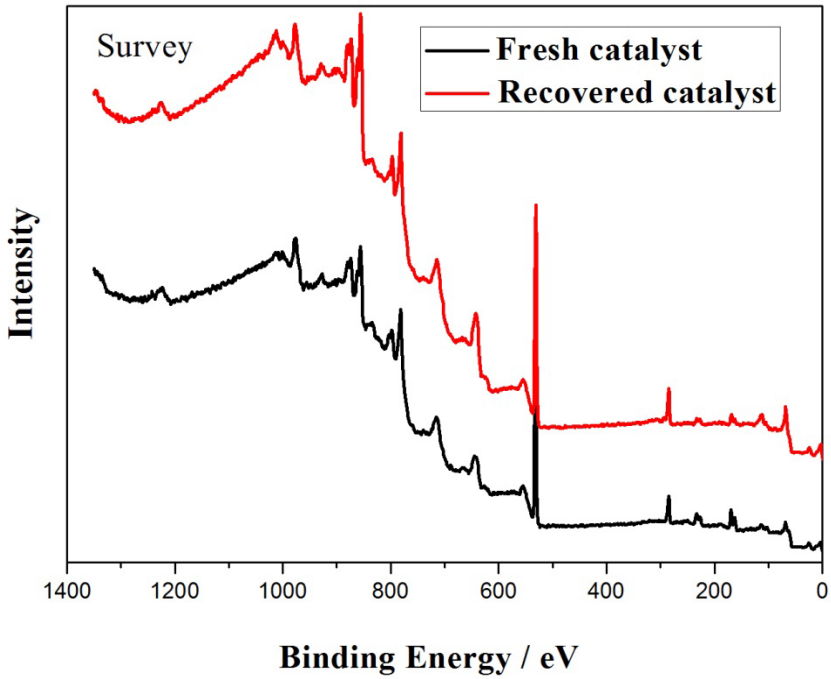

Fig. S6 Survey of XPS of fresh and recovered Co_3O_4@Co_3S_4/NF-24h.

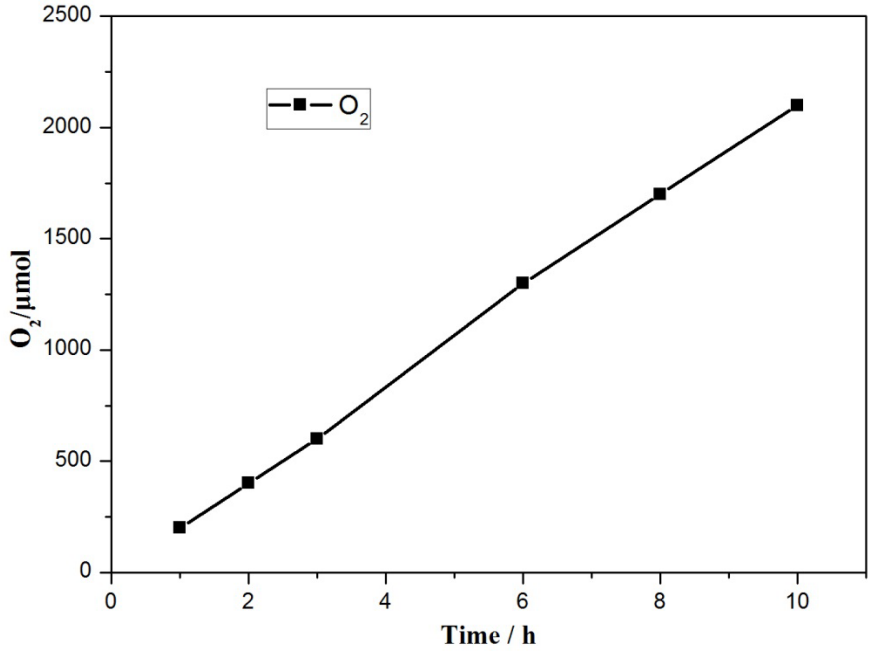

Fig. S7 O_2 production over Co_3O_4@Co_3S_4/NF-24h, measured for 10h.

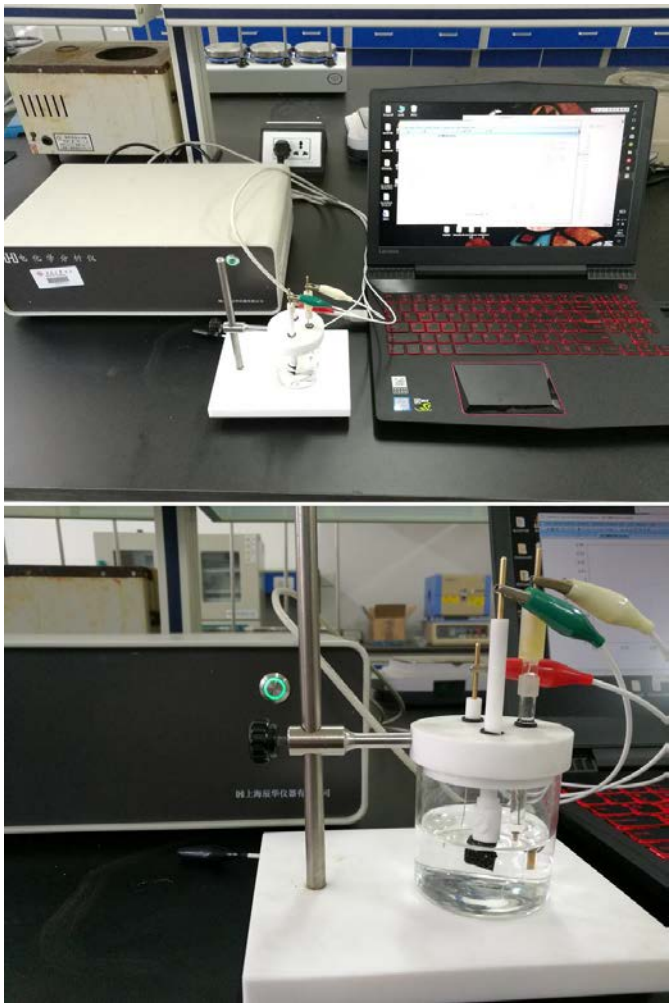

Fig. S8 A photograph showing generation of O_2 bubbles on the Co_3O_4@Co_3S_4/NF-24h electrodes.

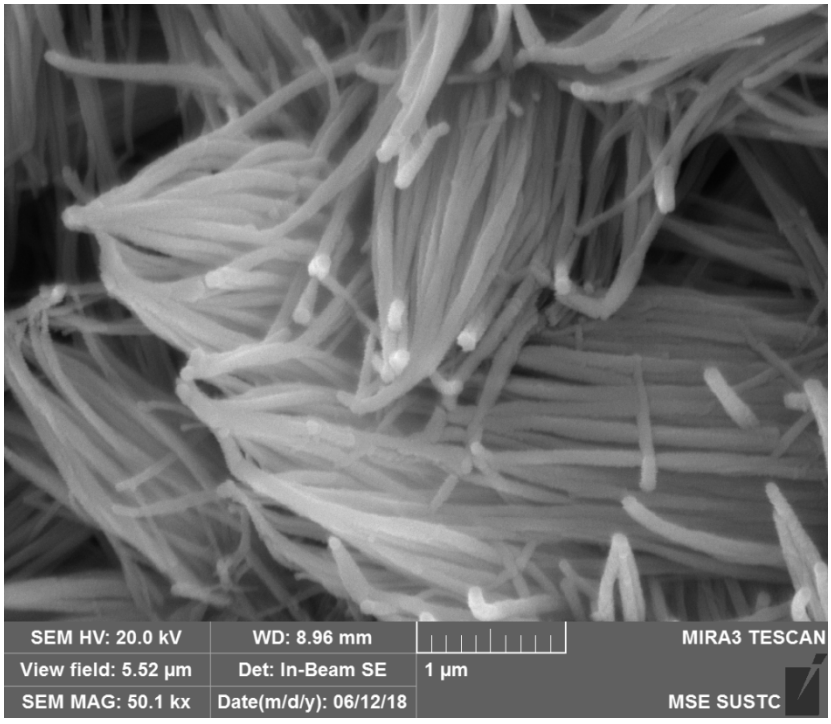

Fig. S9 SEM of Co_3O_4/NF.

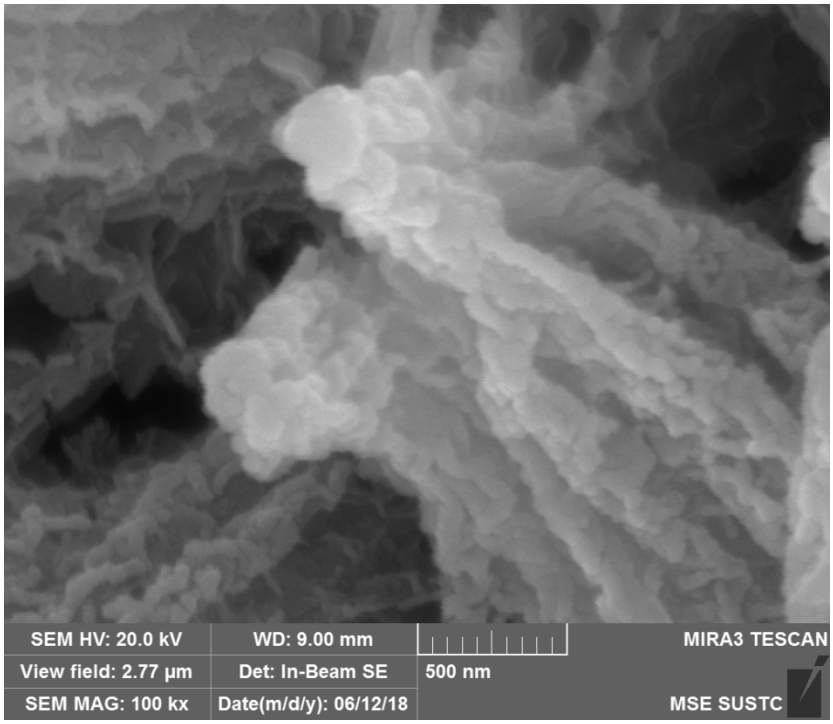

Fig. S10 SEM of Co_3O_4@Co_3S_4/NF-12h.

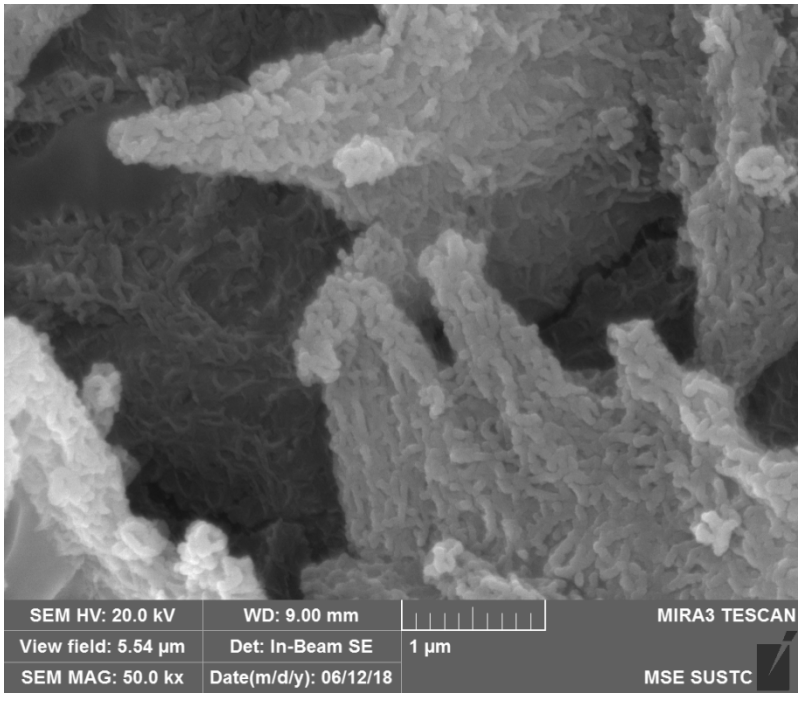

Fig. S11 SEM of Co_3O_4@Co_3S_4/NF-24h.

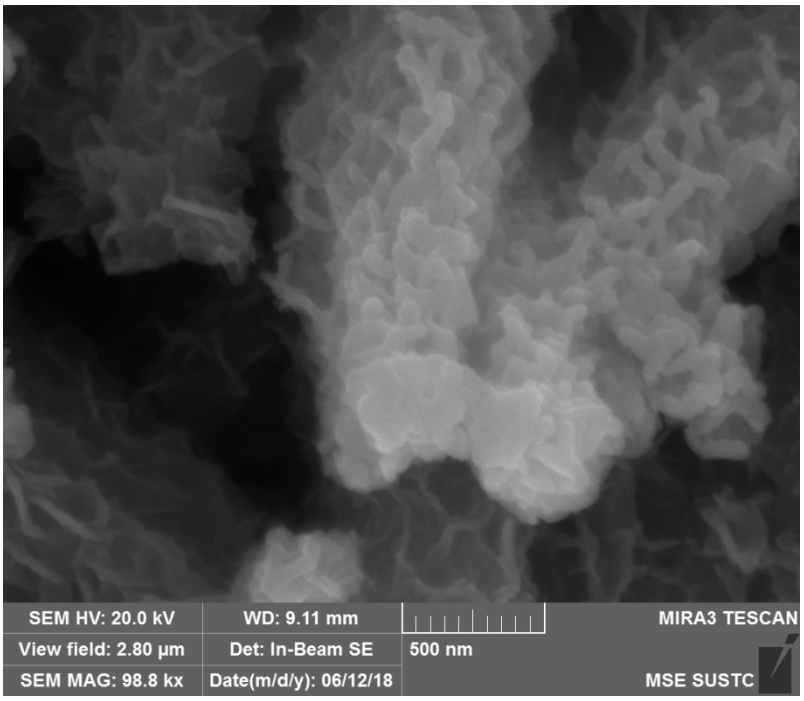

Fig. S12 SEM of Co_3O_4@Co_3S_4/NF-36h.

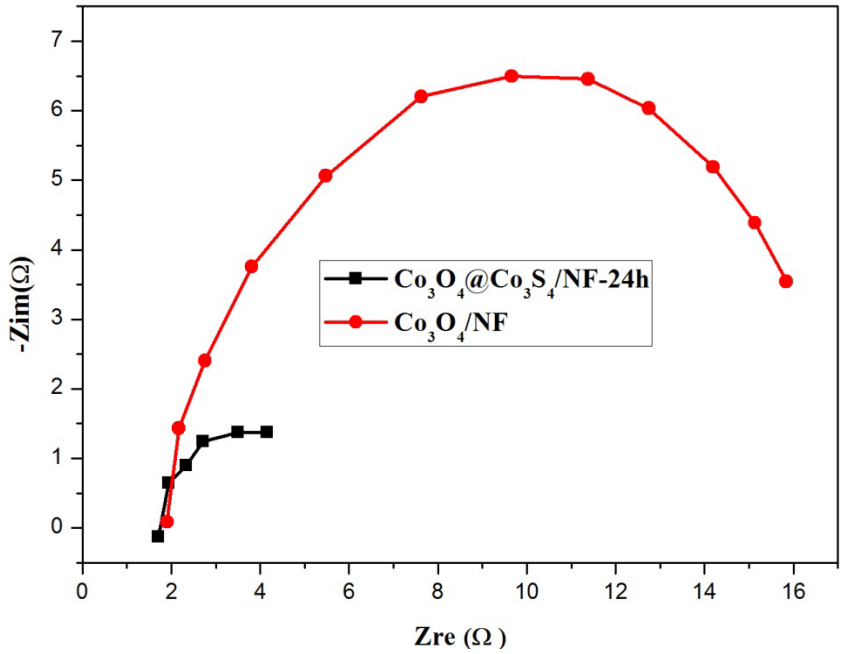

Fig. S13 Electrochemical impedance spectroscope of Co_3O_4/NF and Co_3O_4@Co_3S_4/NF-24h.