Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Electrospun carbon nanofiber@CoS_2 core/sheath hybrid as efficient all-pH hydrogen evolution electrocatalyst

Electronic Supplementary Information

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Calculation of loading ratio of the CoS_2 in CNF@CoS_2 hybrid:

Making a hypothesis that the mass percentage of CNF in CNF@CoS_2 hybrid is x while that of CoS_2 in CNF@CoS_2 hybrid is y. Consequently, $x + y = 1$.

From the TGA curve of pure CoS_2, it can be found that through a complex phase change process, pure CoS_2 remains 74.3% of its original weight. In addition, from the TGA curve of pure CNF, it can be concluded that CNF has almost burned out at 700 °C in air atmosphere. Consequently, for CNF@CoS_2 hybrid with the residue weight percentage of 55.6%, equation can be listed as follows, $y \times 74.3\% + x \times 0 = 1 \times 55.6\%$.

According to the above two equations, y can be calculated as 74.8 wt% while x is 25.2 wt%, illustrating that CoS_2 accounts for the mass ratio of 74.8 wt% in the CNF@CoS_2 hybrid.

Figure captions:

Fig. S1 FESEM image of CNF.

Fig. S2 FESEM image of CNF@CoS_2-3 hybrid and its corresponding EDS mapping images.

Fig. S3 FESEM image of CNF@CoS_2-9 hybrid in higher magnification.

Fig. S4 FESEM image of CoS_2.

Fig. S5 XRD patterns of the products collected after thermal treatment of CNF@CoS_2-3 hybrid at 700 °C and 900 °C.

Fig. S6 Plots showing the extraction of the double layer capacitance (C_{dl}) for CNF@CoS_2-1 and CNF@CoS_2-9 hybrids at 0.2 V.

Fig. S7 Nyquist plots of CNF@CoS_2-3 hybrid at various overpotentials in 0.5 M H_2SO_4.

Fig. S8 FESEM image of CNF@CoS_2-3 hybrid after cycling for 2000 s at low and high magnifications.

Fig. S9 FESEM image of CNF@CoS_2-3 hybrid after cycling test.

Fig. S10 Time dependence of the current density for pure CoS_2 modified GCE recorded at -0.17 V versus RHE in 0.5 M H_2SO_4 solution.

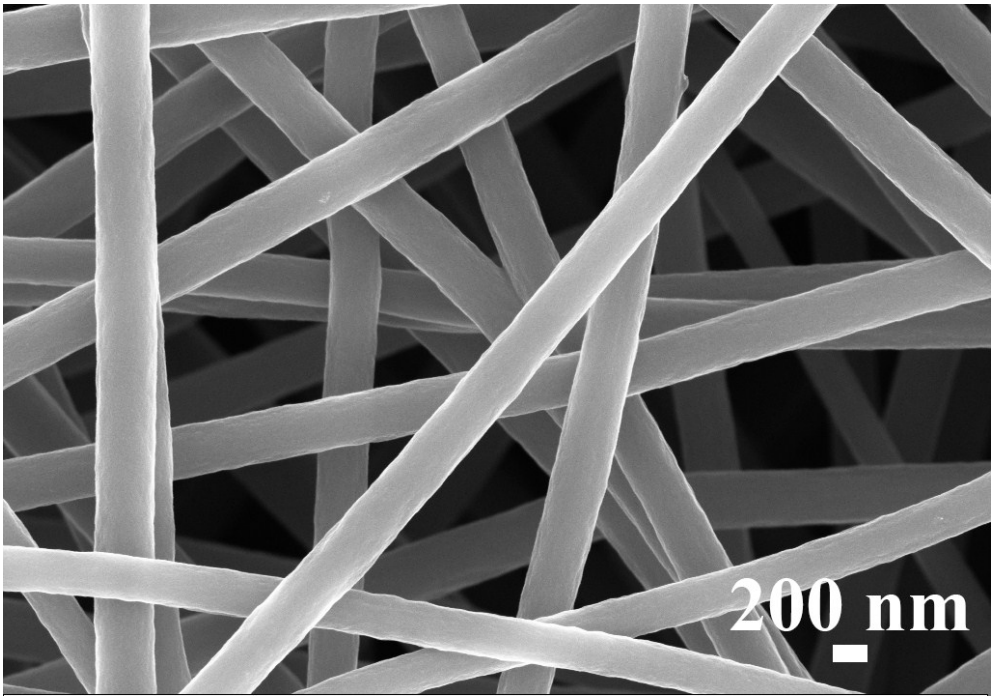

Fig. S1

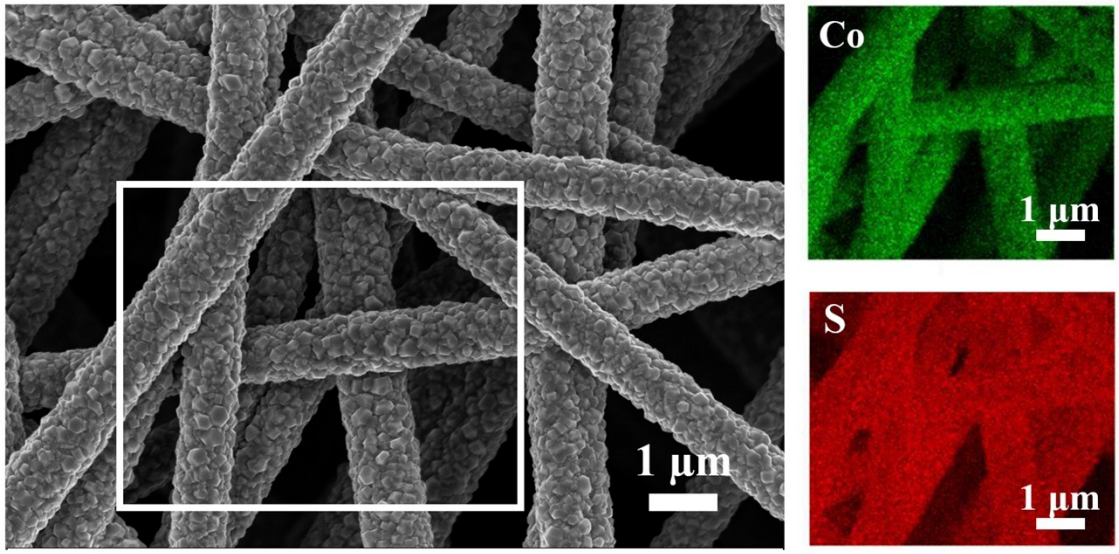

Fig. S2

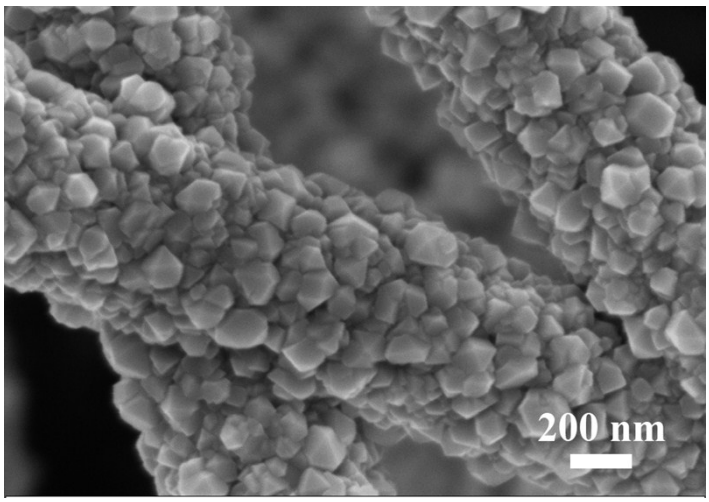

Fig. S3

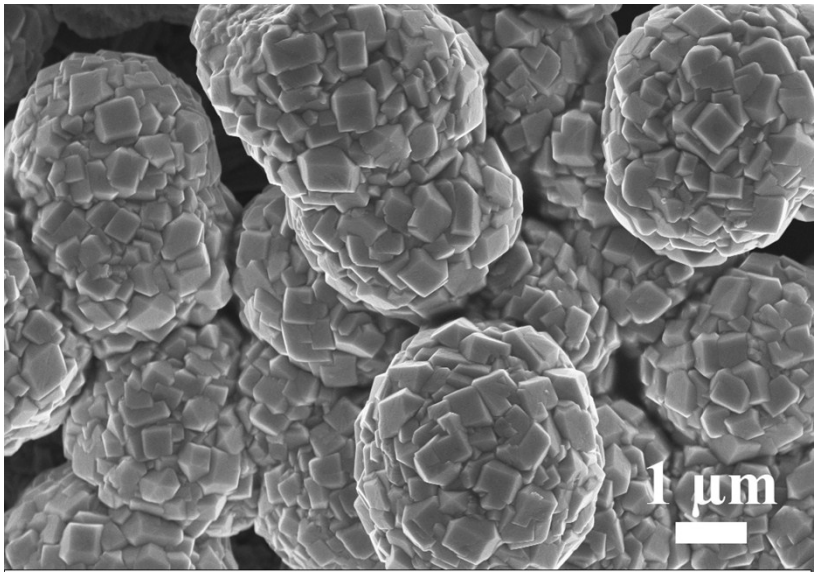

Fig. S4

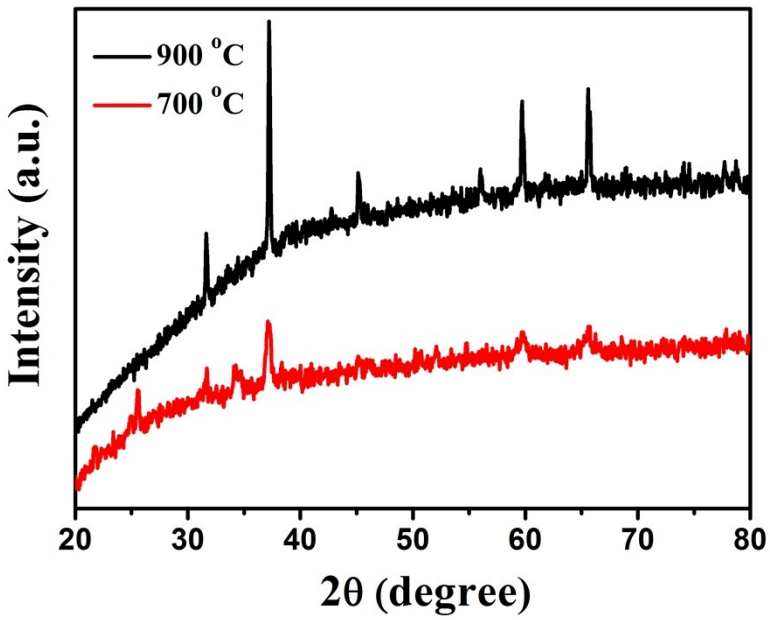

Fig. S5

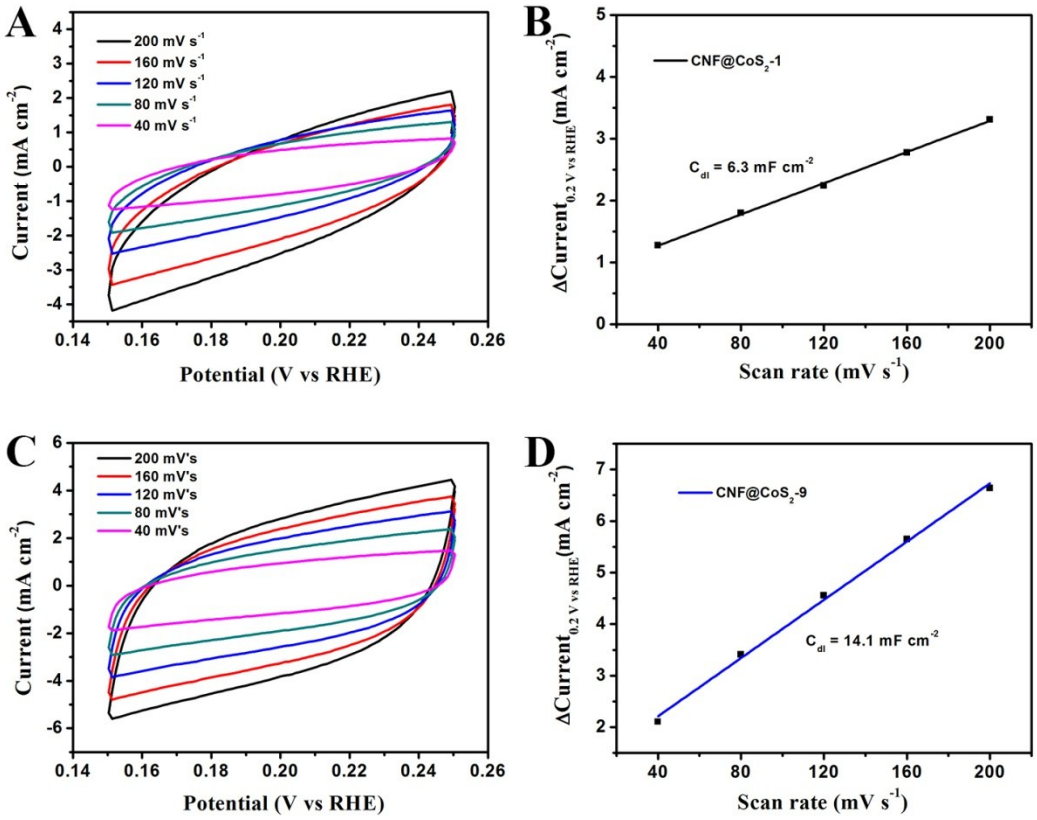
A
200 mV s-1
160 mV s-1
120 mV s-1
80 mV s-1
40 mV s-1
Current (mA cm-2)
Potential (V vs RHE)
B
CNF@CoS2-1
Cdl = 6.3 mF cm-2
ΔCurrent0.2 V vs RHE(mA cm-2)
Scan rate (mV s-1)
C
200 mV's
160 mV's
120 mV's
80 mV's
40 mV's
Current (mA cm-2)
Potential (V vs RHE)
D
CNF@CoS2-9
Cdl = 14.1 mF cm-2
ΔCurrent0.2 V vs RHE(mA cm-2)
Scan rate (mV s-1)

Fig. S6

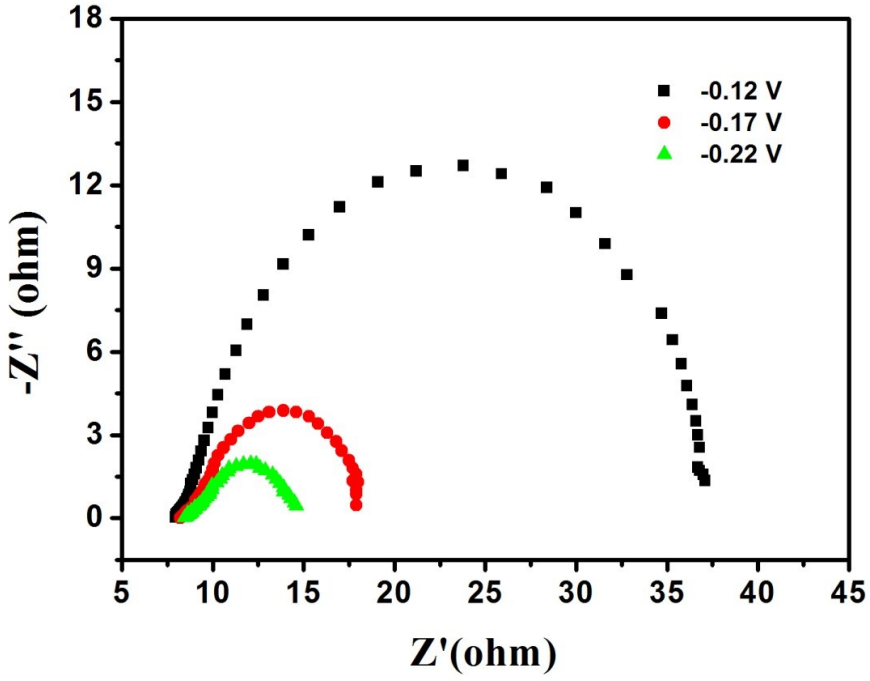

Fig. S7

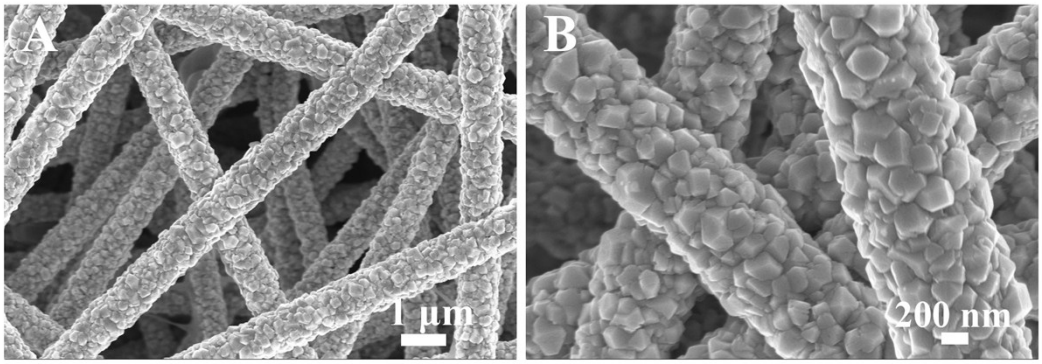

Fig. S8

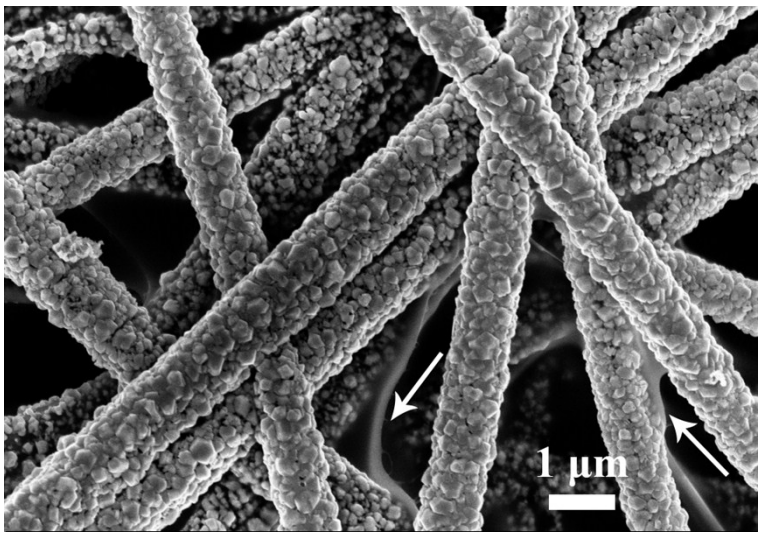

Fig. S9

(residual Nafion solution in white arrow)

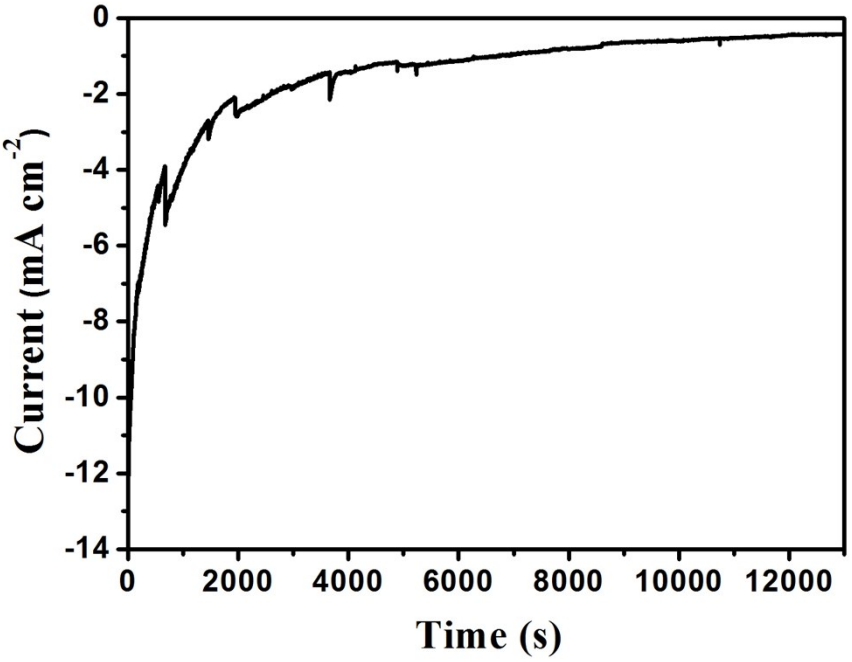
0
-2
-4
-6
-8
-10
-12
-14
Current (mA cm-2)
0
2000
4000
6000
8000
10000
12000
Time (s)

Fig. S10