

# Mesoporous nitrogen, sulfur codoped carbon dots/CoS hybrid as an efficient electrocatalyst for hydrogen evolution

## Supporting information

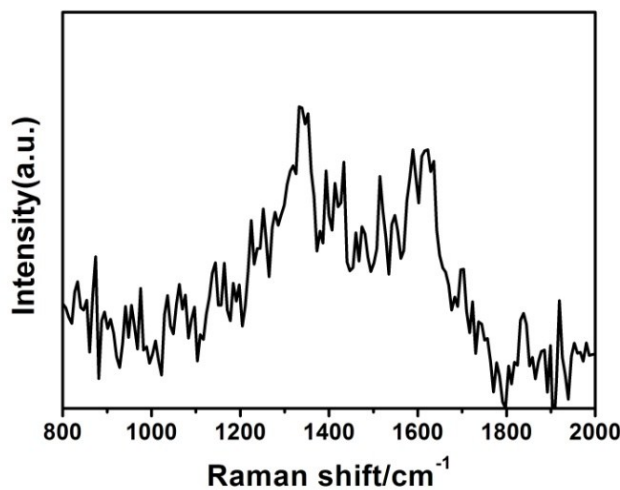


Fig. S1 Raman spectrum of NSCDs.

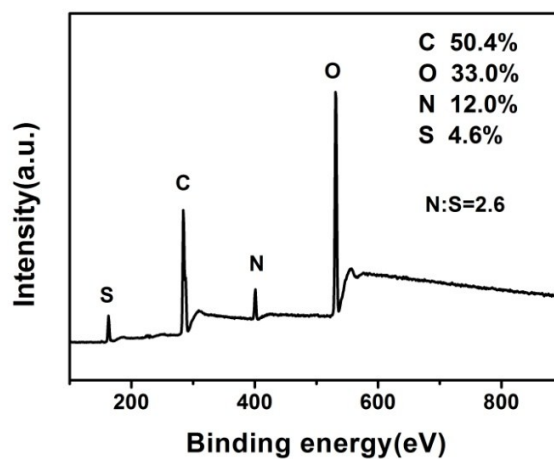
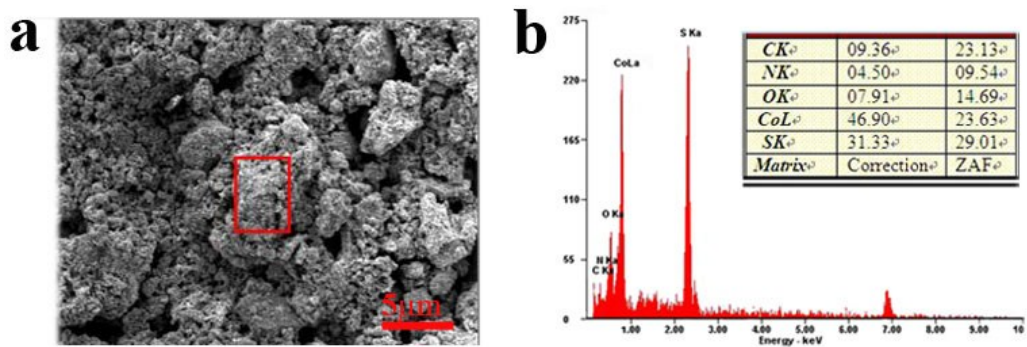
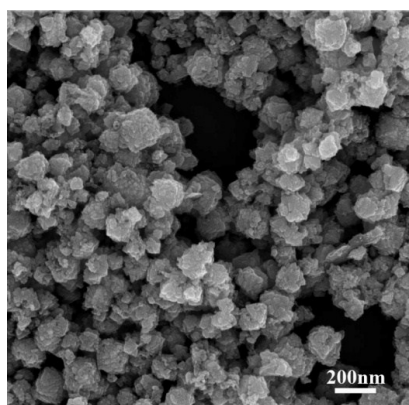


Fig. S2 XPS spectrum of NSCDs. The atomic ratio of N: S for the as-produced NSCDs is 2.6.



**Fig. S3** (a) SEM image and (b) the corresponding EDS profile of NSCDs/CoS-2.



**Fig. S4** SEM image of CoS.



**Fig. S5** Digital photo of NSCDs/CoS-2.

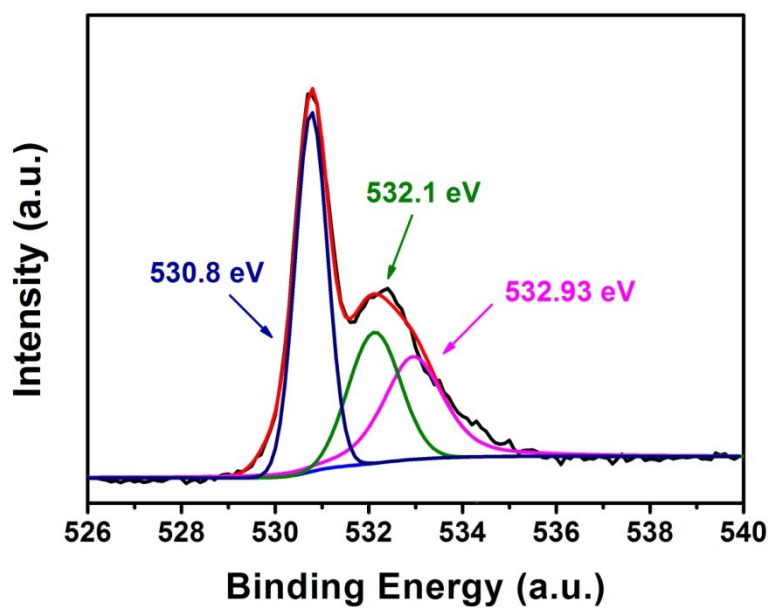


Fig. S6 High resolution O 1s XPS spectra of NSCDs/CoS-2.

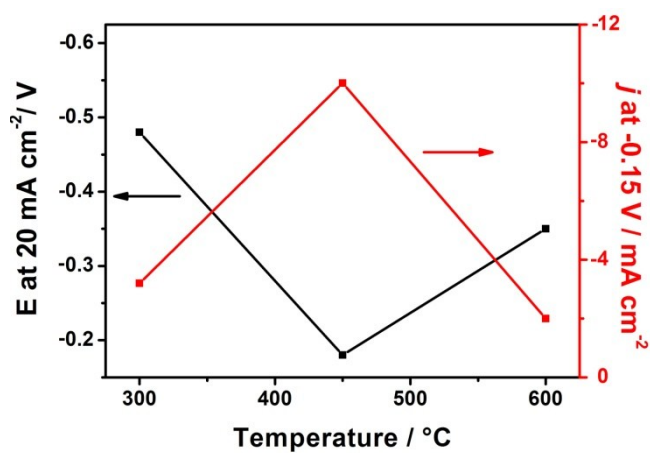


Fig. S7 The variation of the potential at a current density of  $20 \text{ mA}\cdot\text{cm}^{-2}$  (black trace) and current density at  $0.15 \text{ V}$  (the red trace) with different heat-treatment temperature.

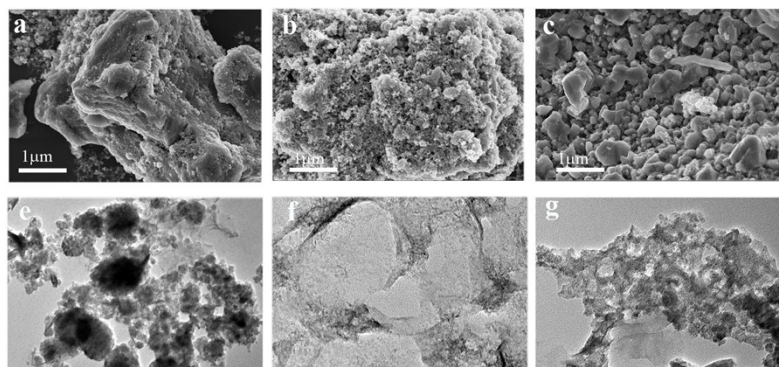
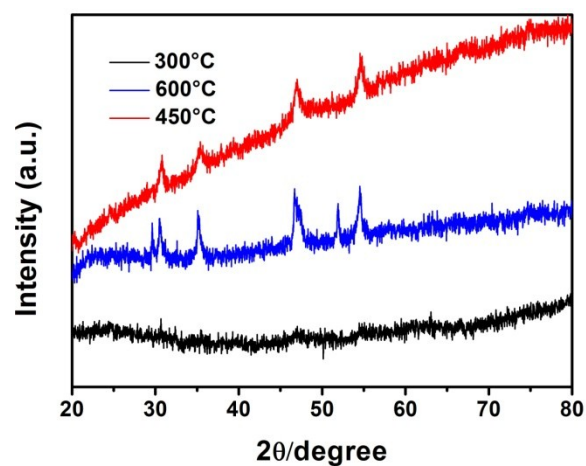
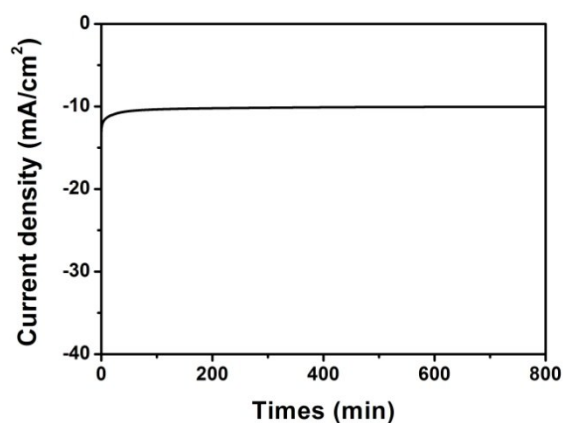


Fig. S8 SEM (a, b and c) and TEM (e, f and g) images of NSCDs/CoS samples calcined at  $300 \text{ }^\circ\text{C}$ ,  $450 \text{ }^\circ\text{C}$  and  $600 \text{ }^\circ\text{C}$ , respectively.



**Fig. S9** XRD patterns of NSCDs/CoS calcined at 300 °C (black), 450 °C (red) and 600 °C (blue), respectively.



**Fig. S10** Chronoamperometric response for NSCDs/CoS-2 (graphite rod as counter electrode).

**Table 1** Comparisons of the HER performance in 0.5 M H<sub>2</sub>SO<sub>4</sub> electrolyte among the NSCDs/CoS with the similar electrocatalysts.

Catalyst	Loading (mg/cm <sup>2</sup> )	Current density (mA cm <sup>-2</sup> )	$\eta$ (mV)	Tafel Slope (mV dec <sup>-1</sup> )	Ref.
WS <sub>2</sub> /CC	14	10	184	72	45
MW/CoS	~	10	275	75	46
CoS/CP/CT	0.32	10	180	72	47
ST-CoS	~	10	298	90	48
NSCDs/CoS	<b>0.25</b>	<b>10</b>	<b>165</b>	<b>56</b>	<b>This work</b>