Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplementary Information

Carbon layer protected self-supporting $CoSe_2$ nanowire arrays for super durable hydrogen evolution reaction catalyst

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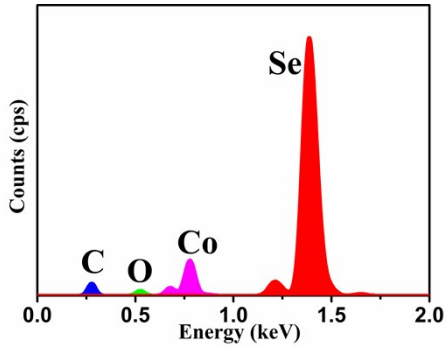


Fig. S1 The EDX energy spectrum of C@$CoSe_2$/CC.

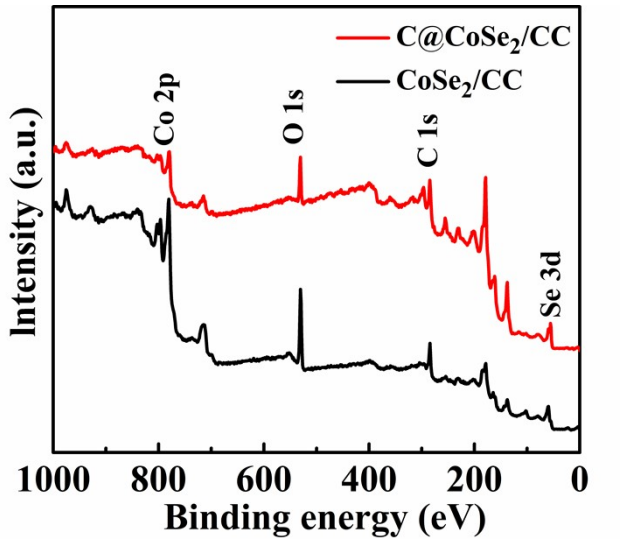
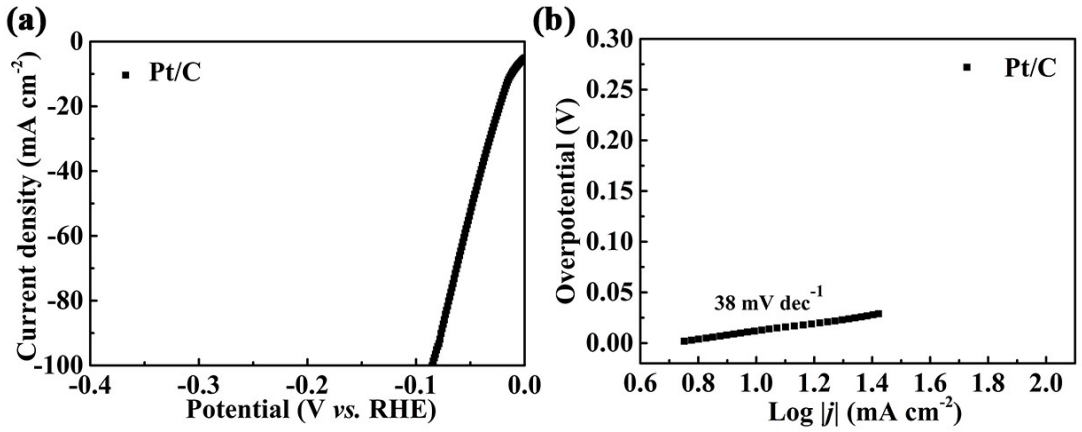
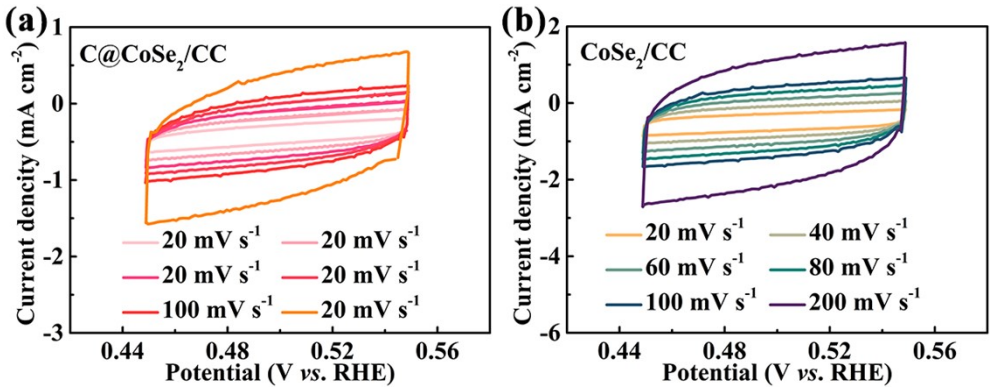


Fig. S2 The XPS Spectra of C@$CoSe_2$/CC and $CoSe_2$/CC.



Figs. S3 (a) Polarization curves of Pt/C measured at a scan rate of 5 mV/s. (b) Tafel slope for Pt/C.



Figs. S4 CV curves obtained from different scan rates. (a) for C@$CoSe_2$/CC, (b) $CoSe_2$/CC.

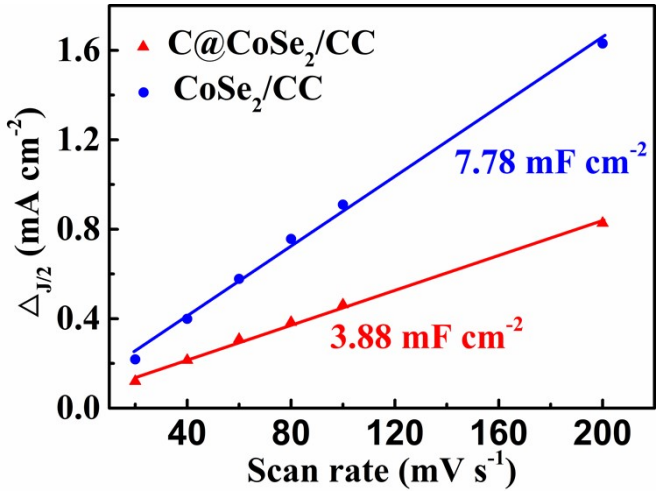


Fig. S5 C_{dl} fitted lines

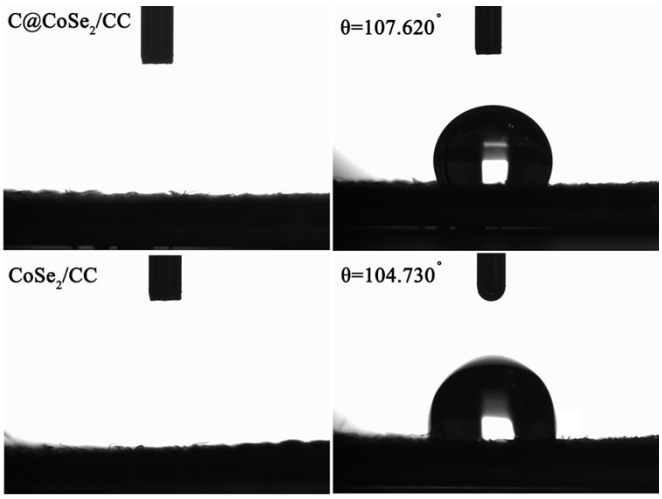


Fig. S6 The water contact angle images of $CoSe_2$/CC and C@$CoSe_2$/CC.

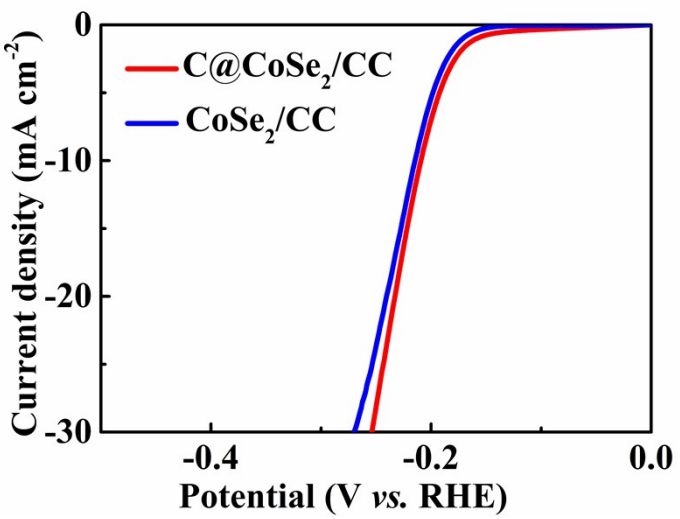


Fig. S7 C_{dl}-normalized LSV curves.

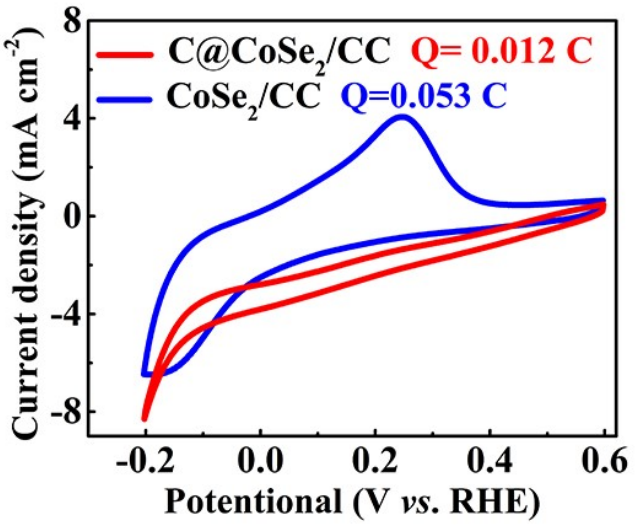


Fig. S8 CV curves measured in phosphate buffer at pH=7.

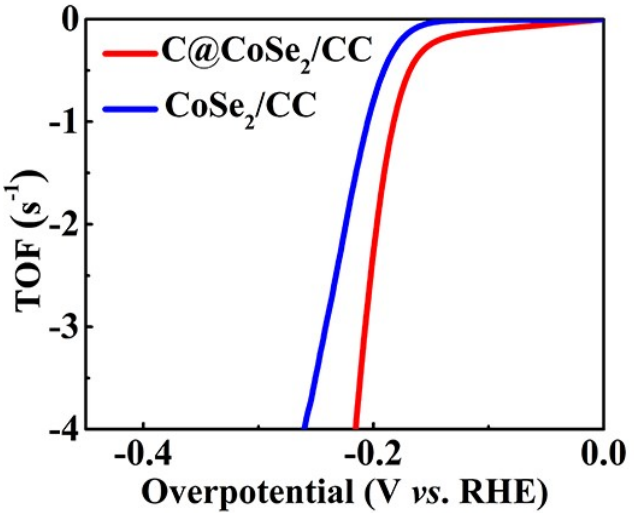


Fig. S9 TOF data.

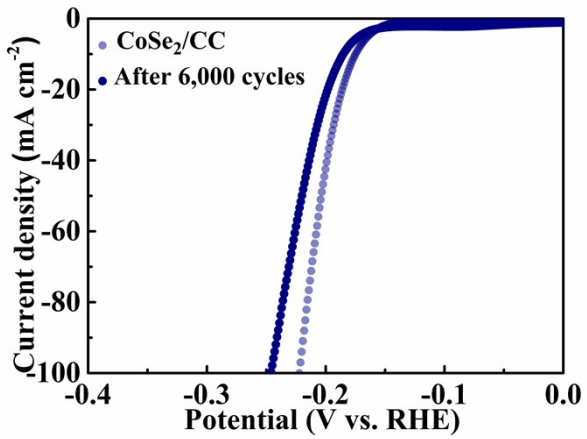


Fig. S10 Polarization curves before and after 6,000 cycles of $CoSe_2$/CC.

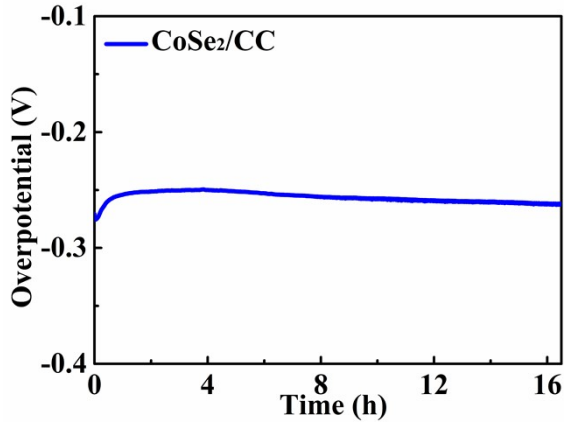


Fig. S11 Long-term stability measurement of $CoSe_2$/CC measured at a current density of 30 mA cm^{-2}.

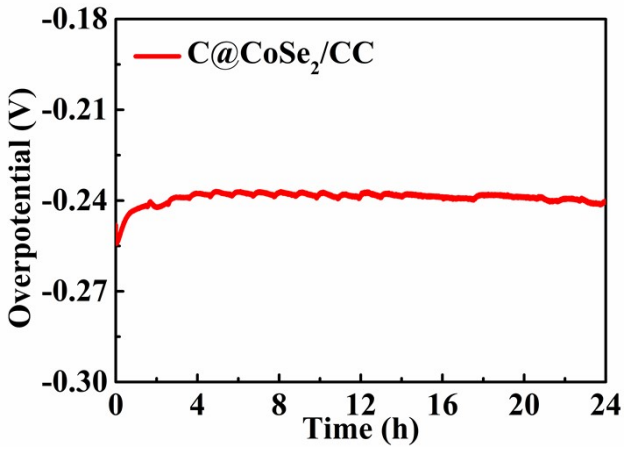


Fig. S12 Long-term stability measurement of C@$CoSe_2$/CC measured at a current density of 30 mA cm^{-2}.

Table S1. The stability of C@$CoSe_2$/CC compared with other HER catalysts.

Catalysts	η_{10}/ mV	Stability test conditions (mA cm^{-2})	Long cycle stability test time (h)	Refs.
C@$CoSe_2$/CC	**179**	**30**	**24**	**Our work**
$CoSe_2$	272	20	8	s1
$CoSe_2$@HC	189.2	10	12	s2
$CoSe_2$/GD	/	10	24	s3
CoSe	186.1	10	10	18
$CoSe_2$/CFP	219	/	/	s4
$CoSe_2$/CoP	140	10	10	s4
$CoSe_2$/CNTs	186	35	22	s5
$CoSe_2$/CNTAs	204	10	8	s6
$CoSe_2$ NP/GC	200	/	/	s7
$CoSe_2$@G	210	22	20	s8
$CoSe_2$@DC	132	10	20	29
$CoSe_2$/DC	206	/	/	29
$MoSe_2$/$CoSe_2$	200	/	/	s9
Co_3O_4 NPs	300	/	/	s10
$CoSe_2$@CP	234	/	/	s11
N-$CoSe_2$@CP	106~200	10	24	s11
c-$CoSe_2$@$Co(OH)_2$	156	20	20	s12
$CoSe_2$/MWCNT	241	/	/	s13
RGO/$CoSe_2$	172	12	2.8	s14

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