Supporting Information for

Dopamine coated layered $Co_{0.85}Se$ as an efficient bifunctional oxygen electrocatalyst

Jin Li [a], Yu Zhang [a], Wenjie Wei [a], Gaochao Fan[a], Zumin Wang [b,] *, Lingbo Zong [a,] *, Lei Wang [a]

a, Key Laboratory of Eco-chemical Engineering, College of Chemistry and Molecular Engineering, Qingdao University of Science and Technology, Qingdao 266042, China

b, State Key Laboratory of Biochemical Engineering, Institute of Process Engineering, Chinese Academy of Sciences, 1 North 2nd Street, Zhongguancun, Haidian District, Beijing 100190, China

** Corresponding authors.*

E-mail addresses: wangzm@ipe.ac.cn

L. Zong: lingbozong@qust.edu.cn

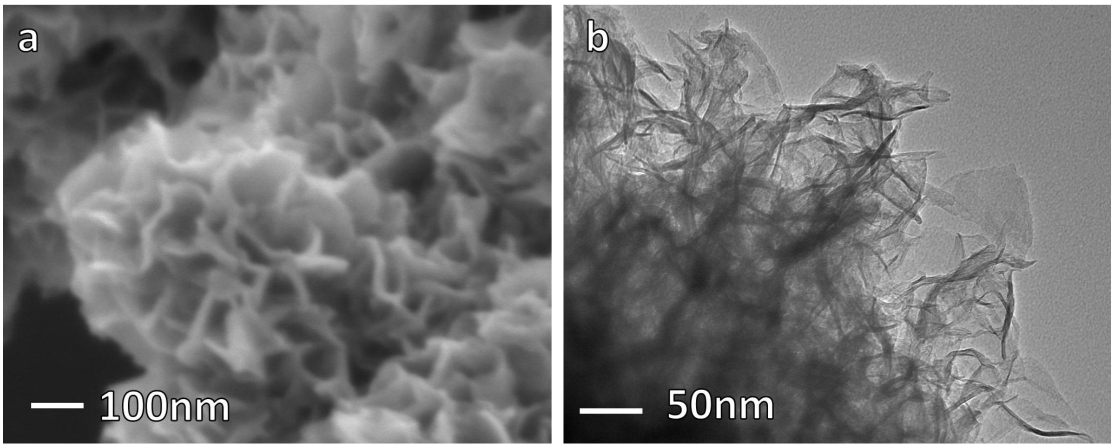

Fig. S1. (a) SEM and (b) TEM images of $CoSe_2$.

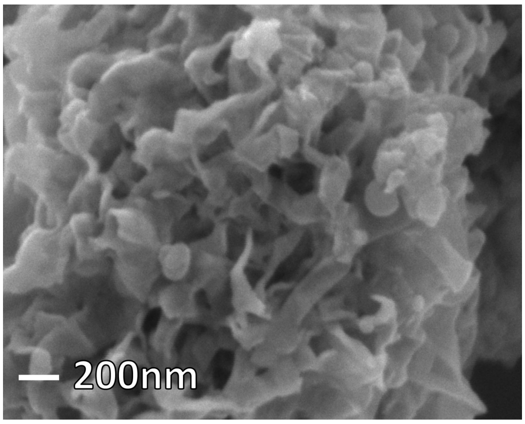

Fig. S2. SEM image of $CoSe_2$ after dopamine coating.

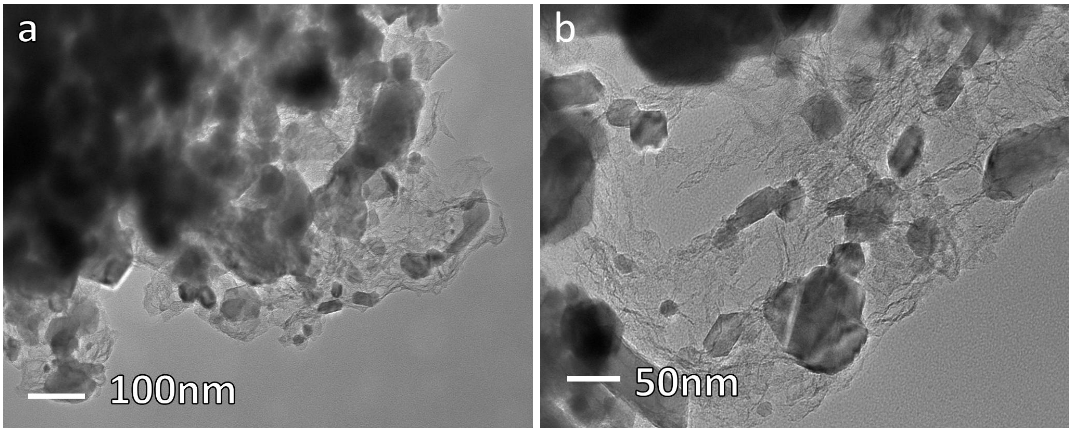

Fig. S3. (a, b) TEM images of $Co_{0.85}Se$ @NC.

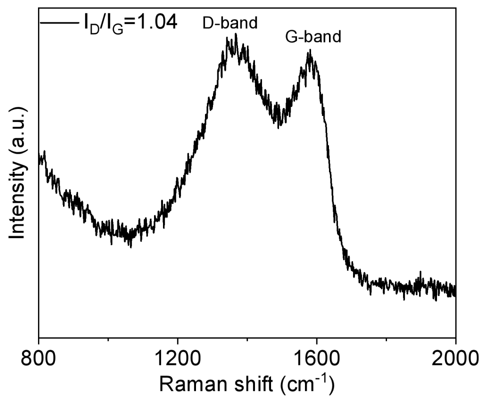

Fig. S4. Raman spectra of $Co_{0.85}Se$@NC.

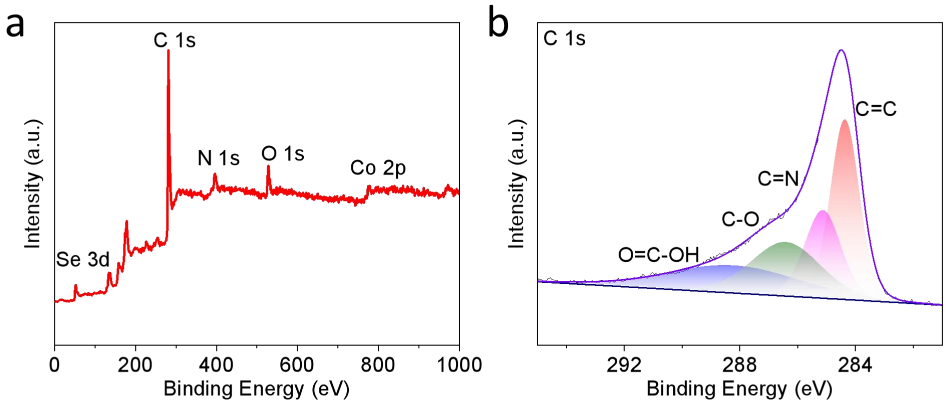

Fig. S5. (a) The survey XPS spectra and (b) high resolution C 1s XPS of $Co_{0.85}Se$ @NC.

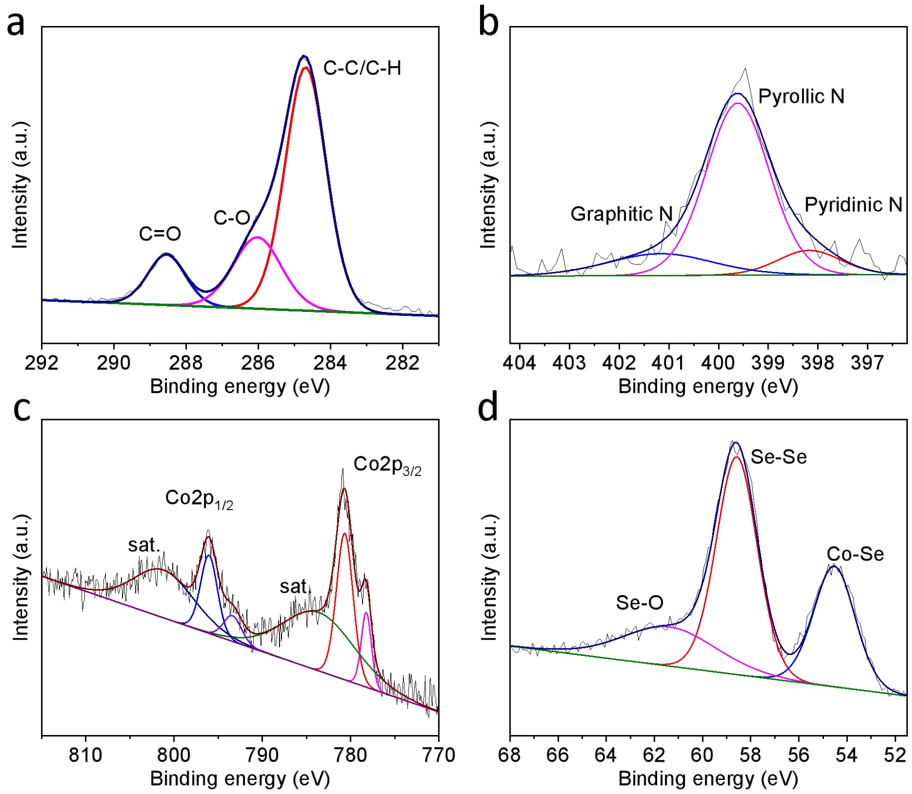

Fig. S6. High resolution (a) C 1s, (b) N 1s, (c) Co2p and (d) Se 3d XPS of $CoSe_2$.

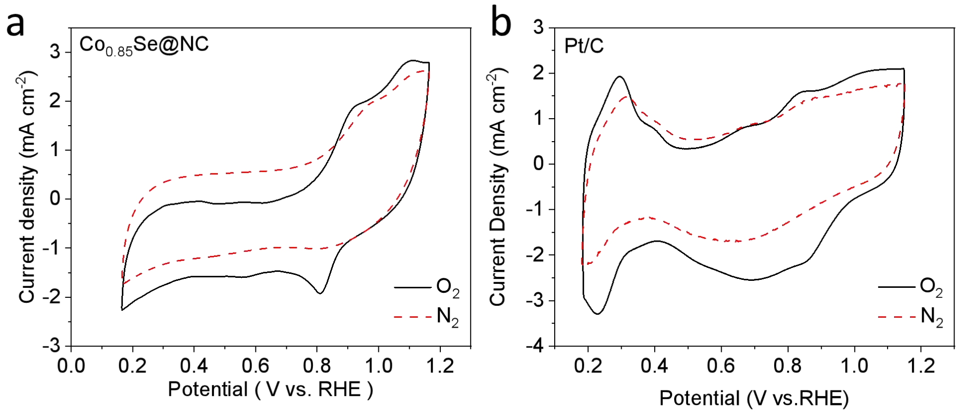

Fig. S7. (a) CV curves of $Co_{0.85}Se$@NC and Pt/C performed in O_2- and N_2-saturated 0.1 M KOH electrolytes .

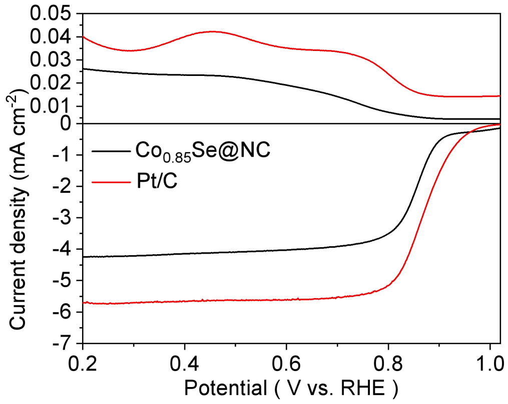

Fig. S8. Rotating ring disk electrode polarization curves of $Co_{0.85}Se$@NC and Pt/C.

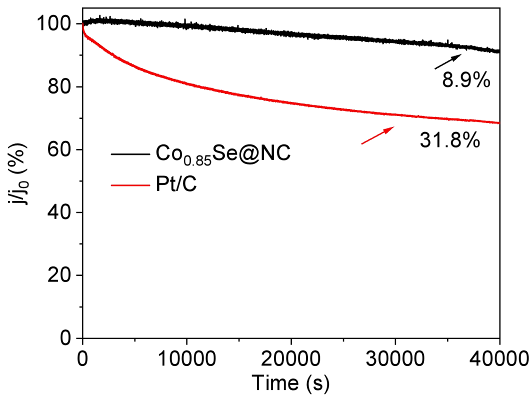

Fig. S9. Chronoamperometric (i-t) curves of $Co_{0.85}Se$@NC and Pt/C under 0.8 V (vs.RHE) in 0.1 M KOH.

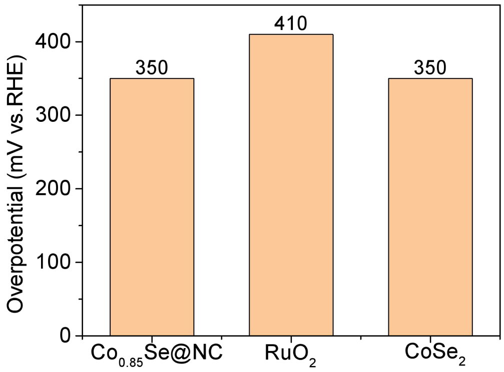

Fig. S10. Comparison of the over-potentials for $Co_{0.85}Se$@NC, RuO_2 and $CoSe_2$ electrocatalysts at 10 mA cm^{-2}.

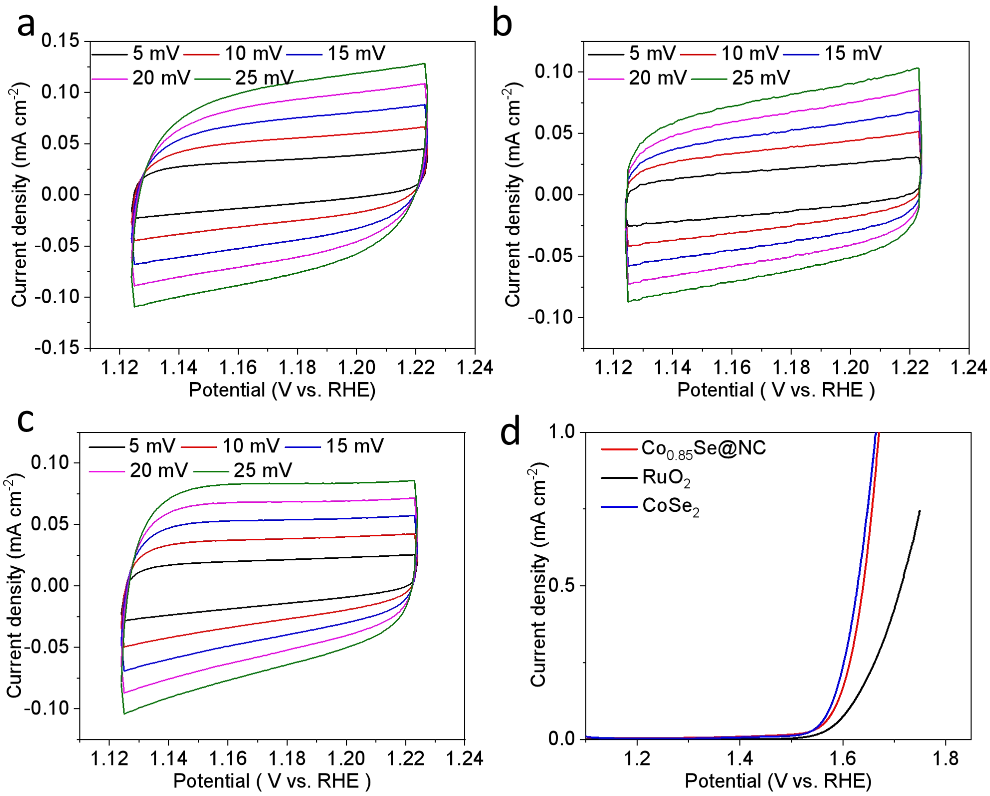

Fig. S11. The cyclic voltammograms (CVs) curves at different scan rates of (a) $Co_{0.85}Se$@NC, (b) RuO_2 and (c) $CoSe_2$. (d) LSV curves of $Co_{0.85}Se$@NC, RuO_2 and $CoSe_2$ normalized into ECSA.

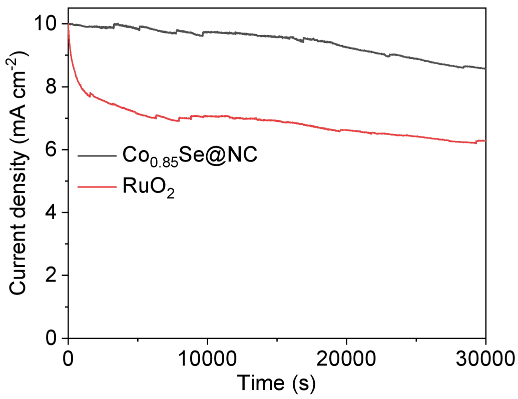

Fig. S12. Chronoamperometric (i-t) curves of $Co_{0.85}Se$@NC and RuO_2 under 1.58 V (vs.RHE) in 1 M KOH.

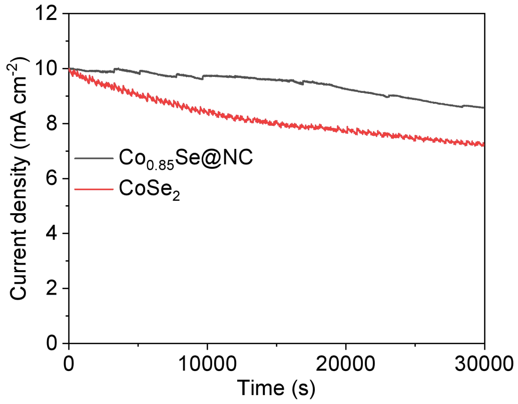

Fig. S13. Chronoamperometric (i-t) curves of $Co_{0.85}Se$@NC and $CoSe_2$ under 1.58 V (vs.RHE) in 1 M KOH.

Table S1. Comparison of peak positions and peak area ratio of Co 2p of $Co_{0.85}Se$@NC and $CoSe_2$.

		Samples	Peak Position (eV)	Peak Area Ratio
Co^{2+}	$2p_{1/2}$	$Co_{0.85}Se$@NC	793.5	8.7 %
		$CoSe_2$	793.4	3.8 %
	$2p_{3/2}$	$Co_{0.85}Se$@NC	777.8	11.7 %
		$CoSe_2$	778.2	6.2 %
Co^{3+}	$2p_{1/2}$	$Co_{0.85}Se$@NC	796.7	14.2 %
		$CoSe_2$	796.1	10.9 %
	$2p_{3/2}$	$Co_{0.85}Se$@NC	780.5	32.0 %
		$CoSe_2$	780.7	20.1 %

Table S2. Comparison of peak positions and peak area ratio of Se 3d of $Co_{0.85}Se$@NC and $CoSe_2$.

	Samples	Peak Position (eV)	Peak Area Ratio
Co-Se	$Co_{0.85}Se$@NC	54.2	11.4 %
	$CoSe_2$	54.5	28.4 %
Se-Se	$Co_{0.85}Se$@NC	56.1	43.5 %
	$CoSe_2$	58.6	50.8 %
Se-O	$Co_{0.85}Se$@NC	59.7	45.1 %
	$CoSe_2$	61.4	20.8 %

Table S3. Comparison of ORR activity of $Co_{0.85}Se$@NC with other ORR catalysts reported before.

Catalyst	**E_{onset}(V vs.RHE)**	**$E_{1/2}$(V vs.RHE)**	**References**
$Co_{0.85}Se$@NC	1.0	0.85	This work
Co-N-C SA/HCF	0.928 V	0.801 V	1
NBCNT-10	0.958 V	0.82 V	2
3DOM P-$Co_3O_{4-\delta}$	0.99 V	0.82 V	3
Co-pyridinic N-C	0.99 V	0.87 V	4
PCN-226(Co)	0.83 V	0.75V	5
Co_1-N_3PS/HC	1.00 V	0.92V	6
ZIF-L-Zn@ZIF-67	-	0.86V	7
$CoSe_2$@NC	0.904 V	0.83 V	8
MnSe@MWCNT	0.94 V	0.86V	9
W_2N/WC	0.93V	0.81V	10
Fe_3C-Co/NC	0.94V	0.885V	11
NiFe@C@Co CNFs	0.974V	0.87V	12
RuCoOx	-	0.855V	13
Co/Fe/Mo/NC	0.96V	0.84V	14
Fe_2N@BNC-2	0.981V	0.844V	15
2% Ru-NCO	-	0.88V	16

Table S4. Comparison of OER activity of $Co_{0.85}Se$@NC with other catalysts reported before.

Catalyst	**Overpotential/mV (10 mA cm^{-2})**	**Electrolyte**	**References**
$Co_{0.85}Se$@NC	350	1 MKOH	This work
$CoSe_2^{(400)}$ -NC-800	360	1 MKOH	17
Ni-Co-S/NF	391	1 MKOH	18
CoPPi nanowires	359	1 MKOH	19
Ni-Fe-S/rGO	366	1 MKOH	20
CoS_x@$CuMoS_4$	351.4	1 MKOH	21
$CuCo_3S_2$/CC	346	1 MKOH	22
CS@N-CT	350	1 MKOH	23
$CoSe_2$@NC	340	1 MKOH	8
Ir/pyrrolic-N_4-G	320	1 MKOH	24
NiFe@C@Co CNFs	336	1 MKOH	12
D-Co@NC	488	0.1 MKOH	25
CoNi@CoCN	340	1 MKOH	26

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