Electronic Supplementary Information

Atomically Thin $MoSe_2$/graphene and WSe_2/graphene Nanosheets for Highly Efficient Oxygen Reduction Reaction

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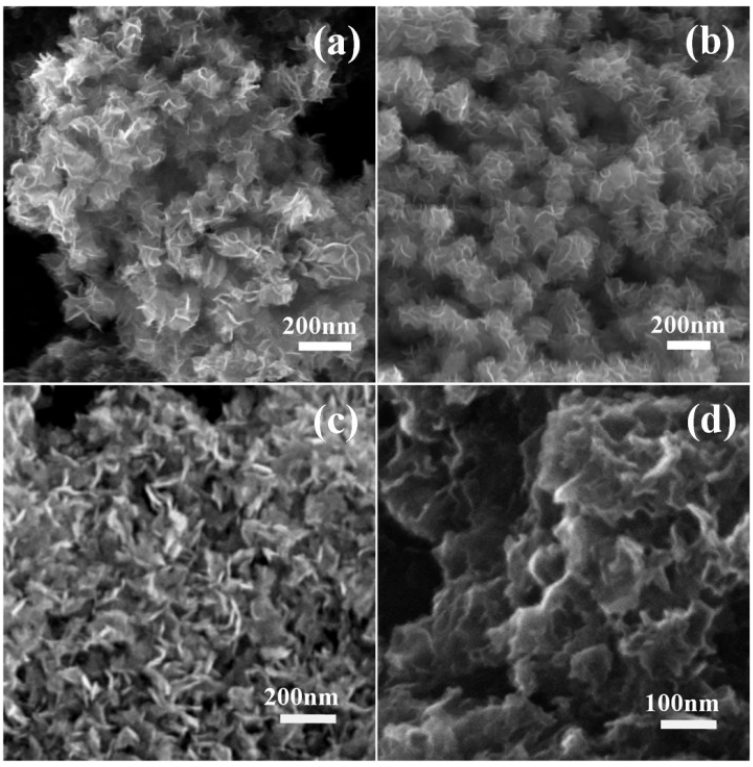

Figure S1 SEM images of (a) $MoSe_2$, (b) g–$MoSe_2$, (c) WSe_2, and (d) g–WSe_2.

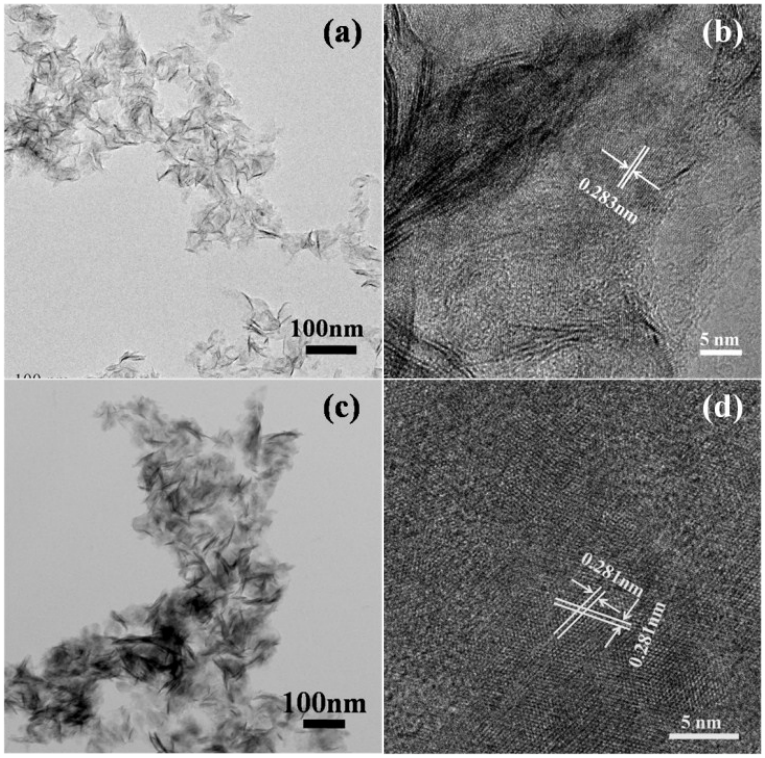

Figure S2 (a,b) TEM and HRTEM image of $MoSe_2$. (c,d) TEM and HRTEM image of WSe_2.

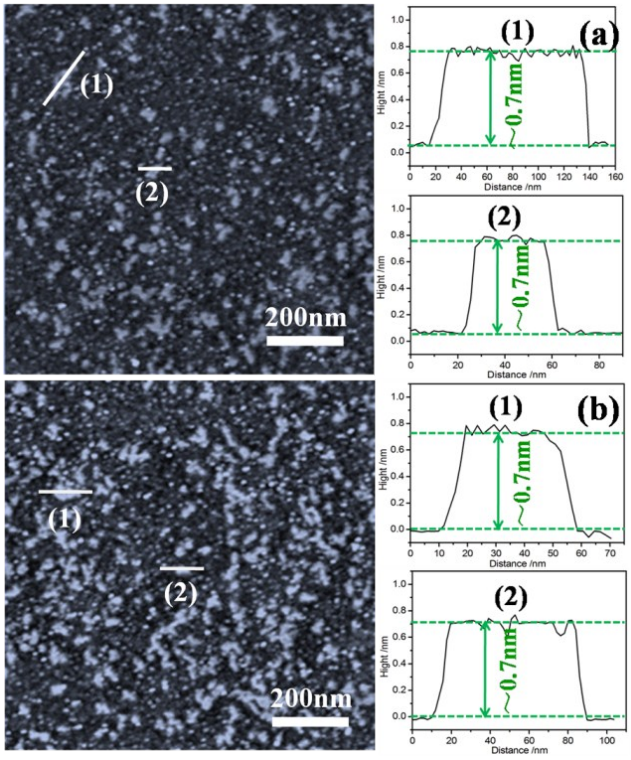

Figure S3 AFM image and height profiles from sections as indicated by the white lines of $MoSe_2$ (a) and WSe_2 (b).

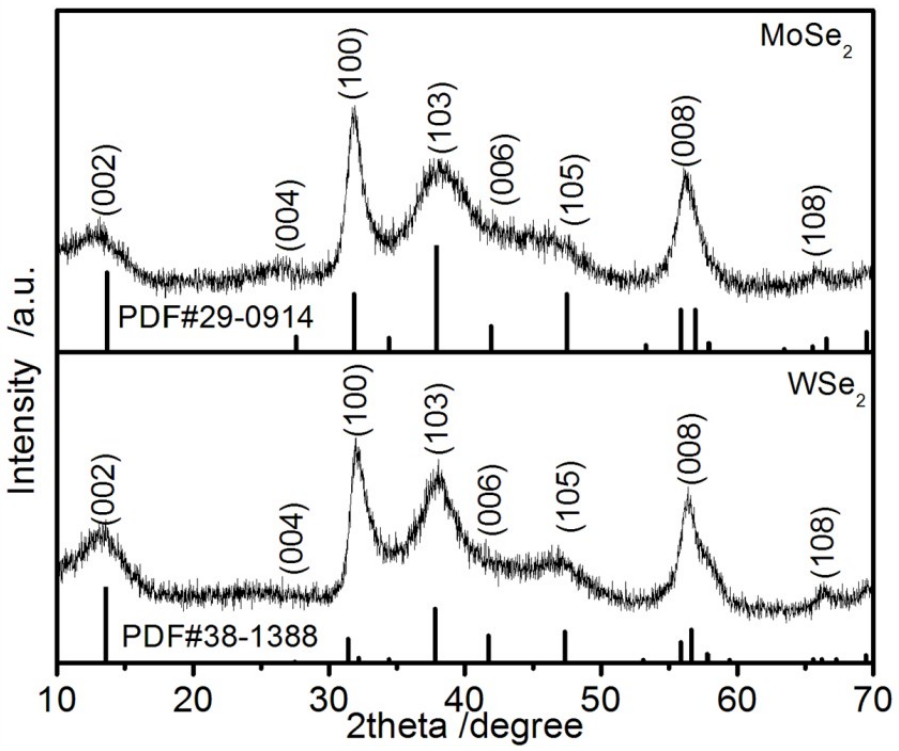

Figure S4 XRD patterns of the WSe_2 and $MoSe_2$ catalyst.

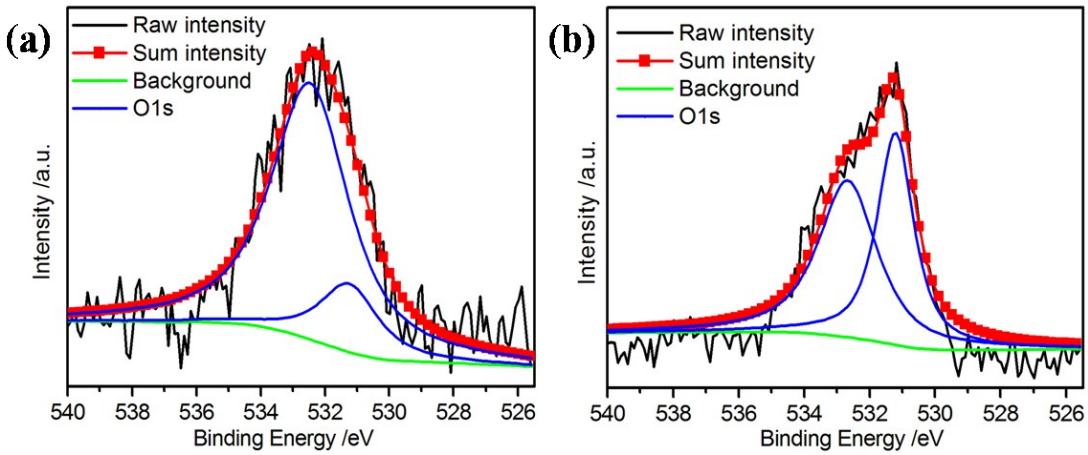

Figure S5 O 1s core-level and corresponding deconvoluted spectra for (a) g–$MoSe_2$ and (b) g–WSe_2 composite.

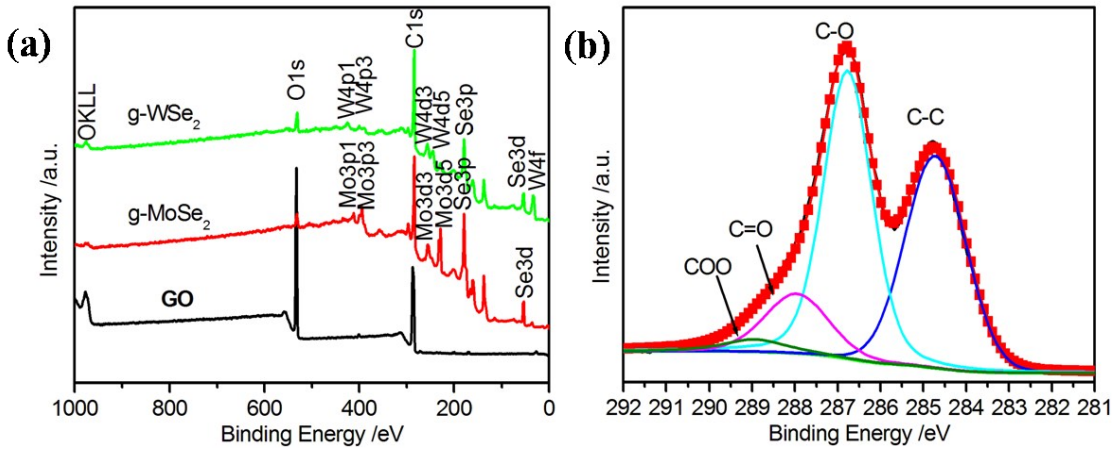

Figure S6 (a) The survey XPS spectra of g–$MoSe_2$, g–WSe_2 and GO, (b) C 1s core-level and corresponding deconvoluted spectra for GO.

Table S1 Percentages of different bindings calculated from the deconvoluted XPS spectra of C 1s peak

Binding	GO	g–$MoSe_2$	g–WSe_2
C-C	32.9%	72.3%	68.1%
C-O	53.2%	18.6%	19.8%
C=O	10.9%	7.2%	7.0%
COOH	3.0%	1.9%	5.1%

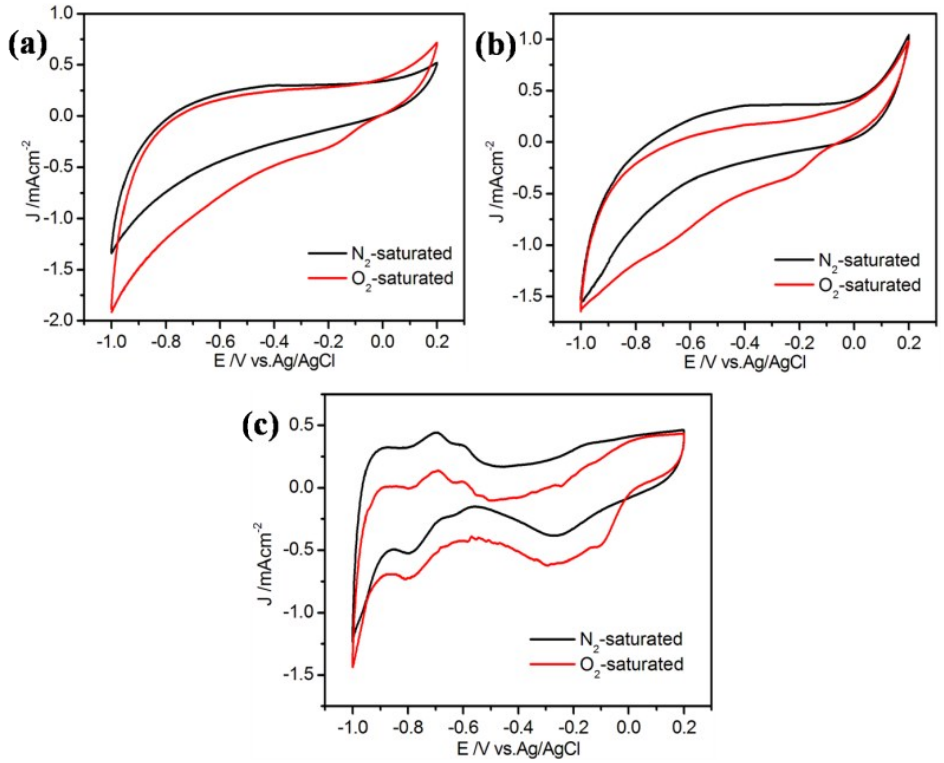

Figure S7 CVs of (a) $MoSe_2$, (b) WSe_2, (c) Pt/C in N_2- and O_2-saturated 0.1M KOH solution at a scan rate of 10 mVs^{-1}.

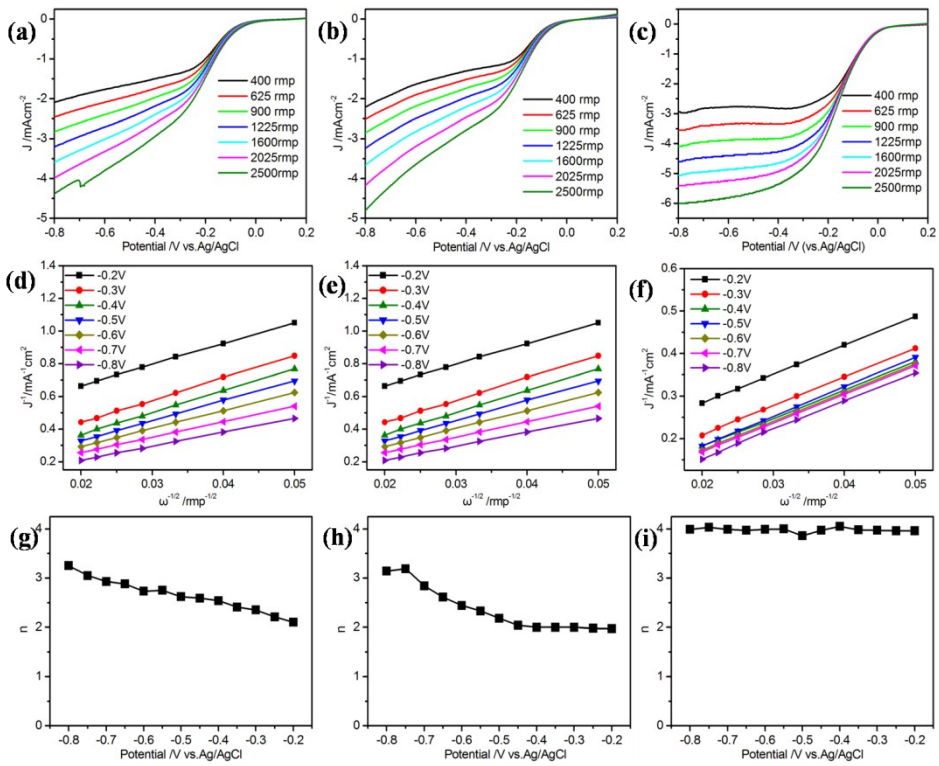

Figure S8 LSVs of (a) $MoSe_2$, (b) WSe_2, (c) Pt/C in O_2-saturated 0.1M KOH at a scan rate of 10 mVs^{-1} at different RDE rotation rates; The calculated K-L plots of the ORR from (d) $MoSe_2$, (e) WSe_2, (f) Pt/C ; Electron- transfer number n (g) $MoSe_2$, (h) WSe_2, (i) Pt/C derived from K–L plots at different potentials.

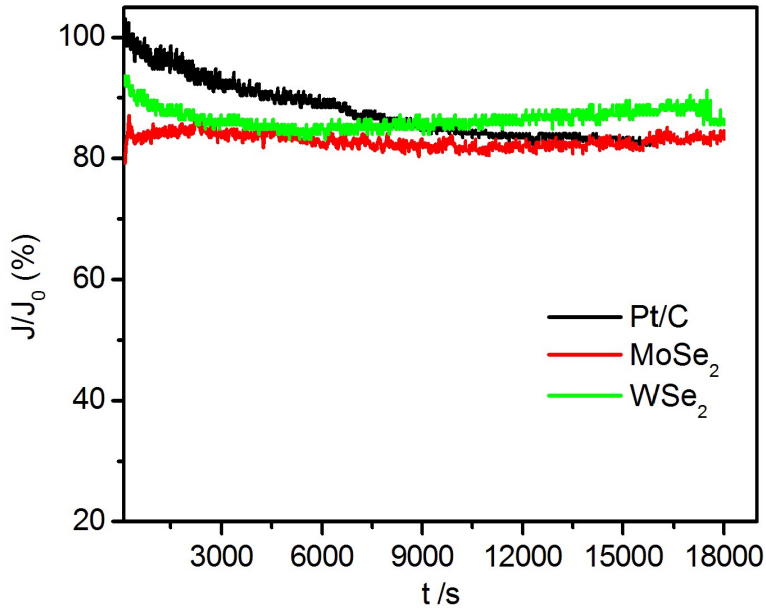

Figure S9 Chronoamperometric response ($i - t$) of $MoSe_2$ and WSe_2. The tests were conducted in O_2-saturated 0.1 M KOH solution at –0.3V.

Table S2 Electrocatalytic performance of recently reported non-noble metal-based catalysts for ORR in 0.1 M KOH.

Materials	E_p[a](vs. Ag/AgCl)	J/ mA·cm^{-2}[b](at –0.8V)	n	References
g–C_3N_4/C	–0.177 V	5.8	3	1
$Co_{0.85}Se$/graphene	–	4	3.65	2
$NiCo_2O_4$–rGO	−0.349 V	2.0	3.8	3
Mn_3O_4/N–graphene	–0.30 V	3.70	3.81	4
N–carbon/Fe_3O_4	–0.15 V	5.12 (at –0.6V)	3.92	5
Fe_3O_4/N–GAs	–0.35V	3.96	3.80	6
g–FePc	−0.10 V	5.8	4.00	7
g–$MoSe_2$	–0.15 V	5.35	3.89	This work
g–WSe_2	–0.21 V	5.26	3.98	This work

Note: a. CV, b. LSV.

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