Electronic Supplementary Information for

Synergetic contribution of enriched selenium vacancies and out-of-plane ferroelectric polarization in AB-stacked $MoSe_2$ nanosheets as efficient piezocatalysts for TC degradation

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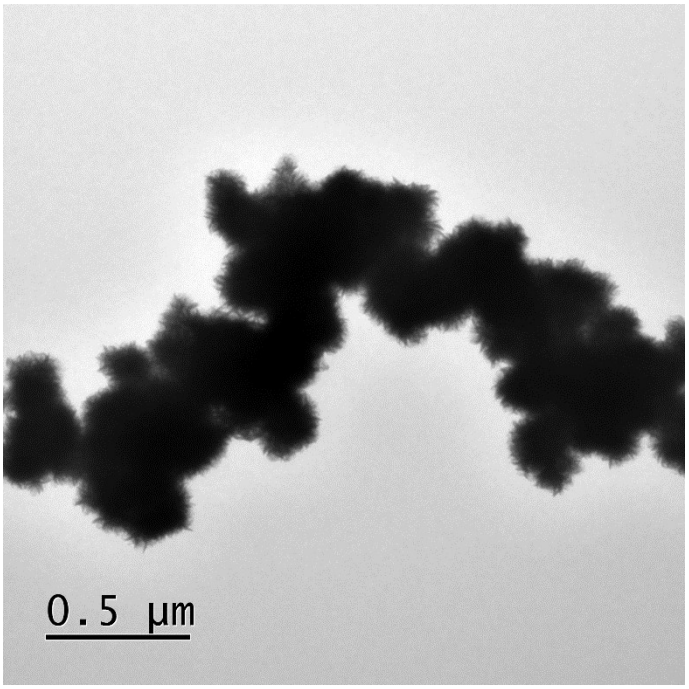
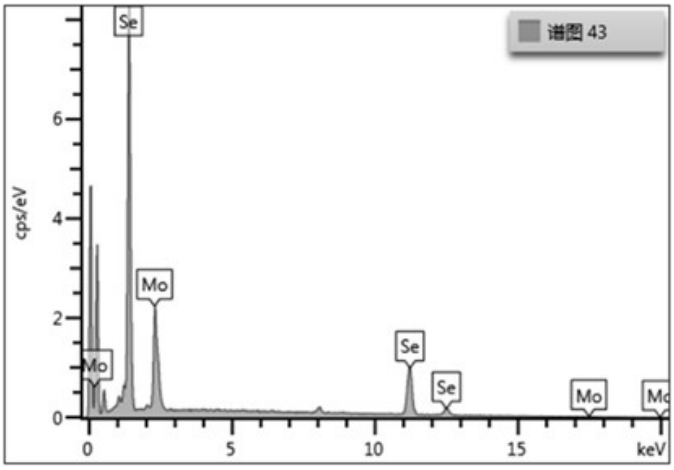


Fig. S1. The TEM image of $MoSe_2$ NFs.



Element	wt%	wt% Sigma	Atomic ratio (%)
Se	58.28	0.53	62.93
Mo	41.72	0.53	37.07
Total:	100.00		100.00

Fig. S2. The EDS of $MoSe_2$ NSs-10.

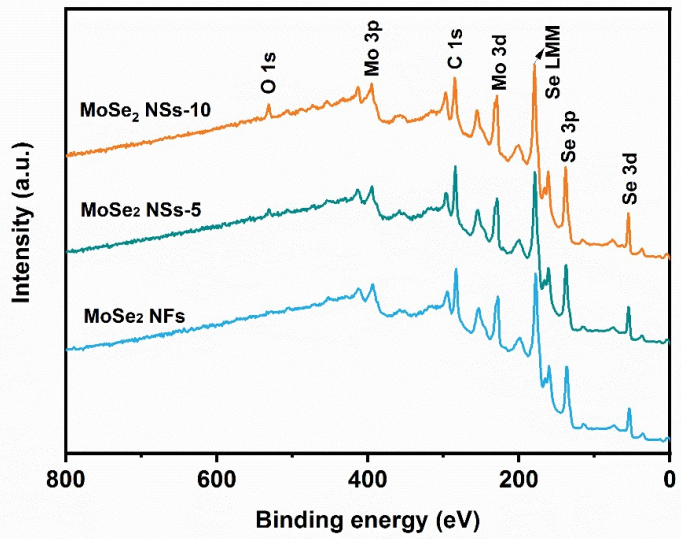


Fig. S3. The XPS survey spectra of $MoSe_2$ NFs, $MoSe_2$ NSs-5 and $MoSe_2$ NSs-10.

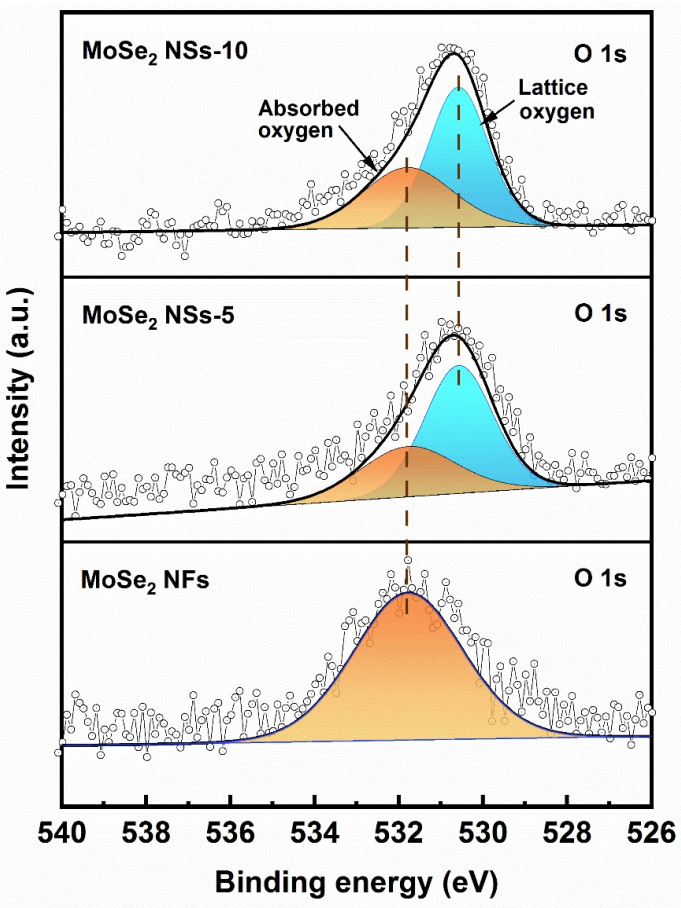
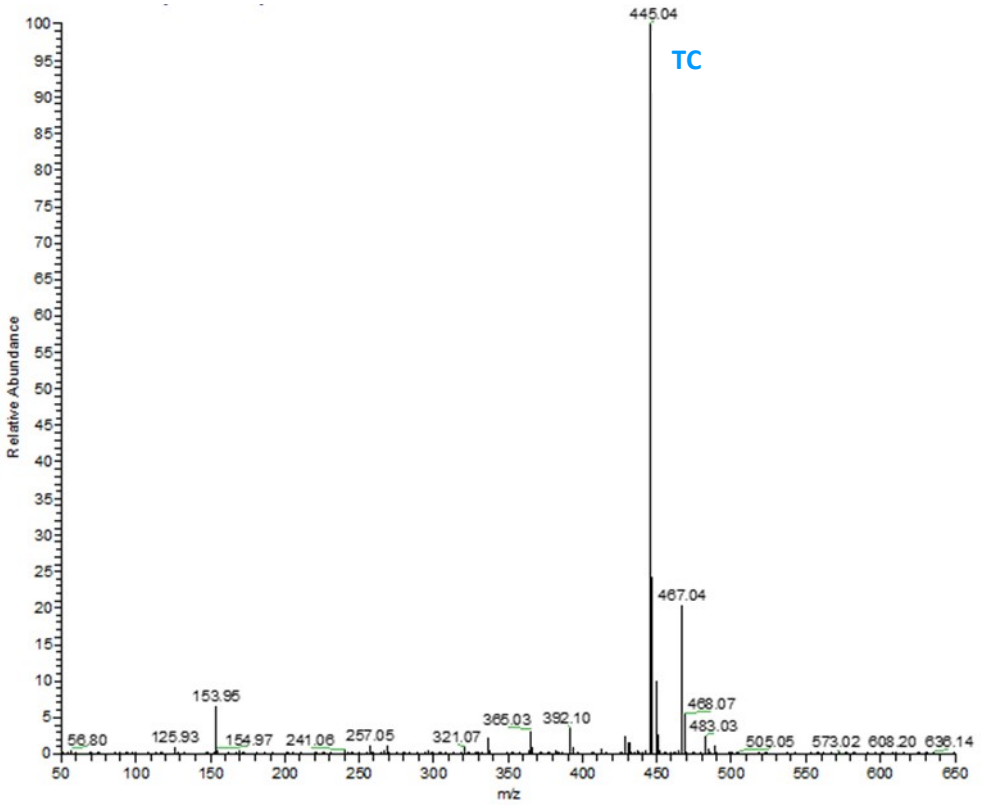
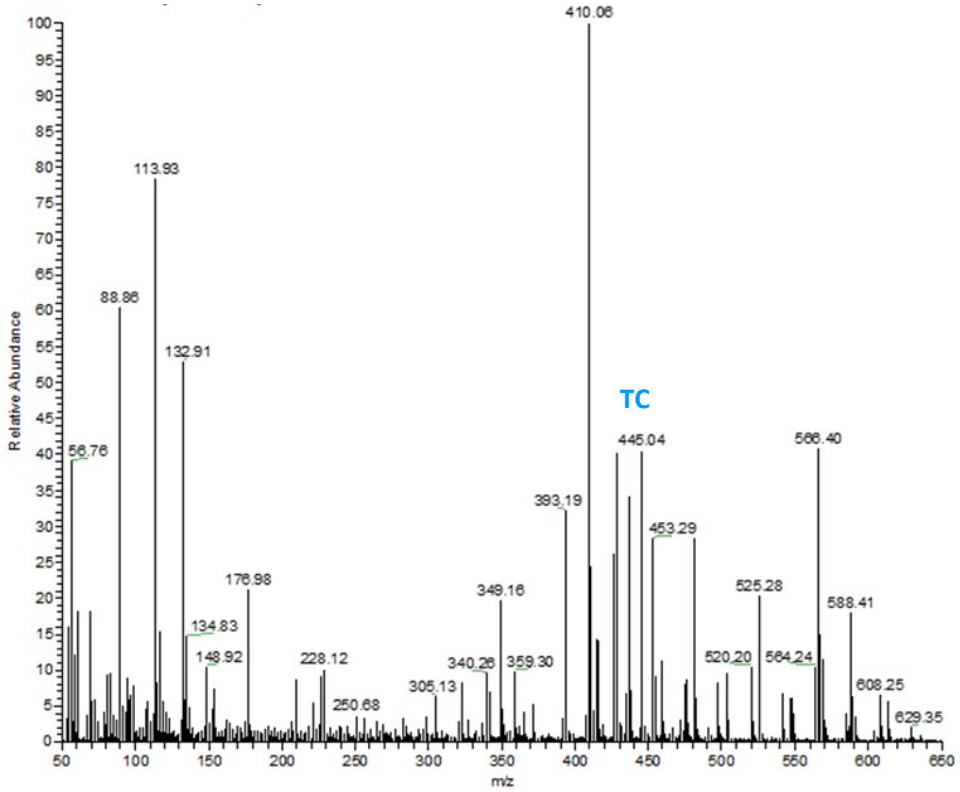


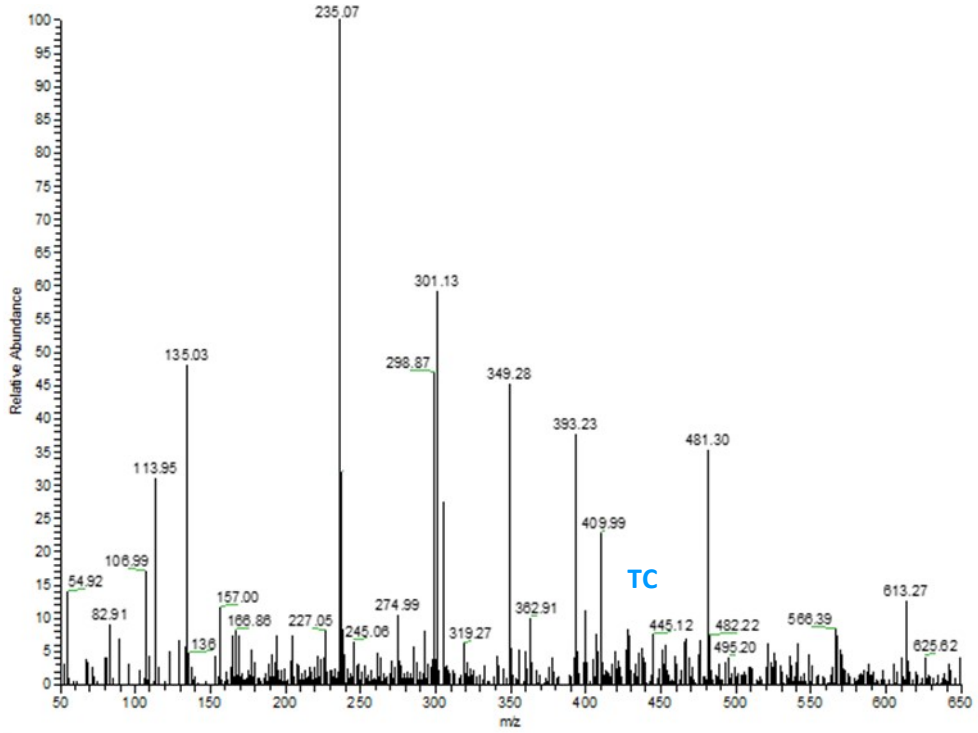
Fig. S4. The high-resolution O 1s spectra of $MoSe_2$ NFs, $MoSe_2$ NSs-5 and $MoSe_2$ NSs-10.

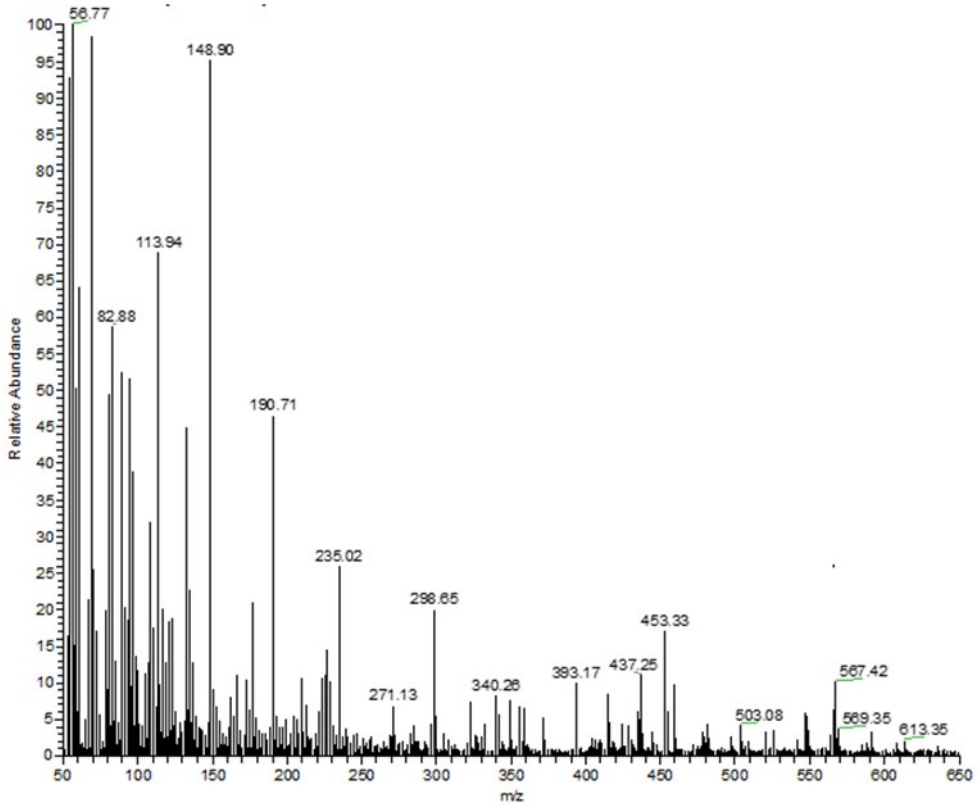
Table S1. A summarized Mo and Se ratio of $MoSe_2$ samples analyzed by X-ray photoelectron spectroscopy.

Samples	Element		Atomic ratio (%)
$MoSe_2$ NFs	Mo	34.64	1:1.83
	Se	63.55	
$MoSe_2$ NSs-5	Mo	36.25	1:1.64
	Se	59.31	
$MoSe_2$ NSs-10	Mo	39.45	1:1.41
	Se	55.79	


TC
445.04
467.04
153.95
468.07
483.03
366.03
392.10
56.80
125.93
154.97
241.06
257.05
321.07
505.05
573.02
608.20
636.14
Relative Abundance
m/z


TC
410.06
113.93
88.86
132.91
56.76
445.04
566.40
393.19
453.29
176.98
349.16
525.28
588.41
134.83
148.92
228.12
340.26
359.30
520.20
564.24
305.13
250.68
608.25
629.35
Relative Abundance
m/z


Relative Abundance
m/z
235.07
301.13
135.03
298.87
349.28
393.23
481.30
113.95
409.99
106.99
54.92
82.91
157.00
166.86
227.05
274.99
362.91
319.27
445.12
482.22
566.39
613.27
625.62
TC


Relative Abundance
m/z
56.77
148.90
113.94
82.88
190.71
235.02
298.65
453.33
271.13
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393.17
437.25
567.42
503.08
569.35
613.35

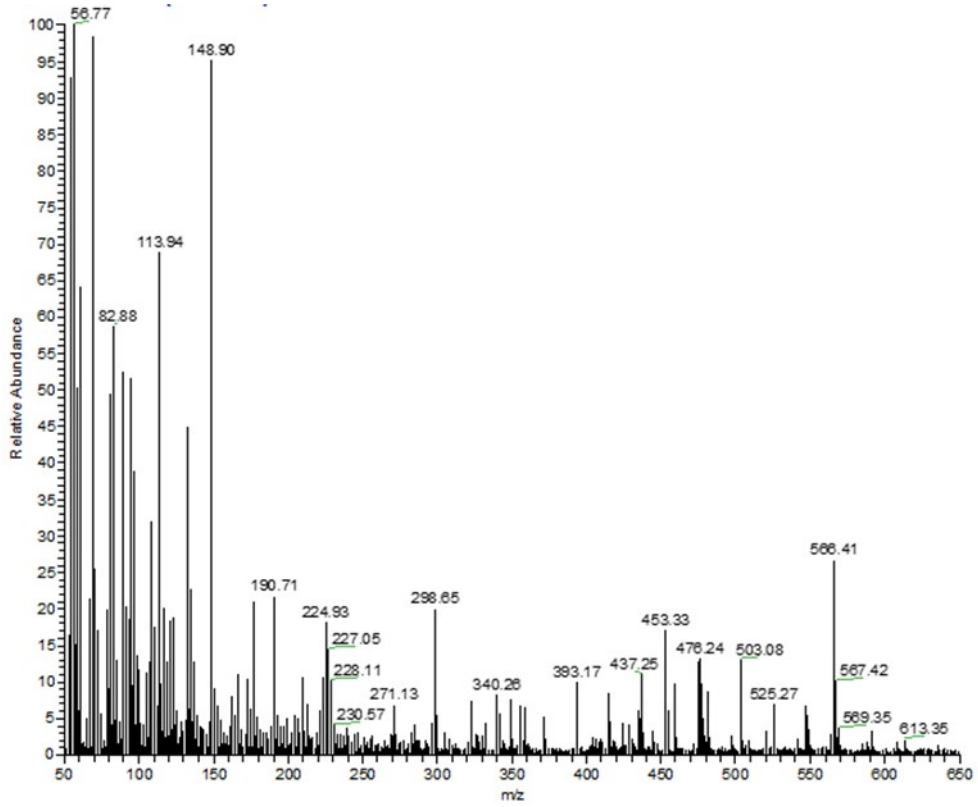
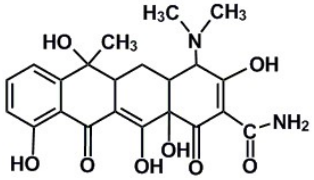
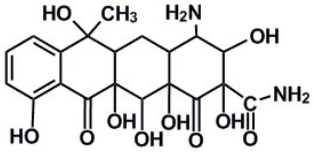
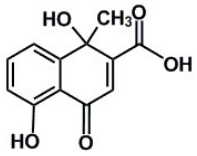
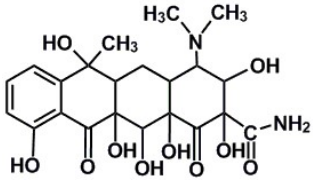
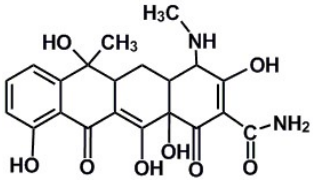
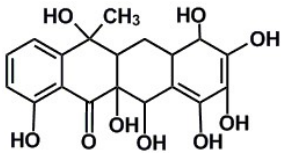
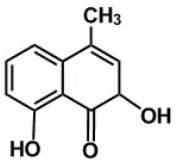
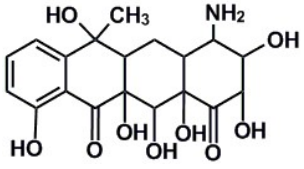
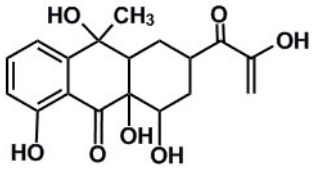
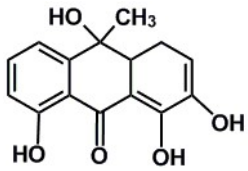
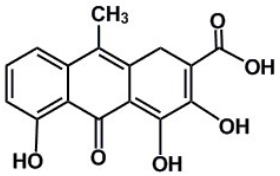
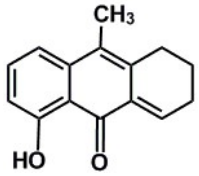


Fig. S5. Mass spectra of tetracycline (TC) and possible intermediates.

It could be found that the peak at 445 (the tetracycline peak) became smaller and smaller, which illustrated that TC molecules had been decomposed gradually. Meanwhile, intermediate products were generated and then decomposed by ·OH/·O_2^- radicals, eventually these compounds were decomposed to CO_2, H_2O and other small molecules.

Table S2. The intermediates identified by HPLC/MS during the degradation of tetracycline.

Product No.	Molecular ion (m/z)	R.T. (min)	Molecular Formula	Proposed Molecular Structure
TC	445	5.03	$C_{22}H_{24}N_2O_8$	
A	453	3.53	$C_{20}H_{24}N_2O_{10}$	
B	235	3.86	$C_{12}H_{10}O_5$	
C	481	4.31	$C_{22}H_{28}N_2O_{10}$	
D	431	4.65	$C_{21}H_{22}N_2O_8$	
E	393	4.86	$C_{19}H_{20}O_9$	
F	190	5.62	$C_{11}H_{10}O_3$	
G	410	6.33	$C_{19}H_{23}NO_9$	

H	349	7.55	$C_{18}H_{20}O_7$	
I	274	8.37	$C_{15}H_{14}O_5$	
J	301	8.81	$C_{16}H_{12}O_6$	
K	227	10.57	$C_{15}H_{14}O_2$	

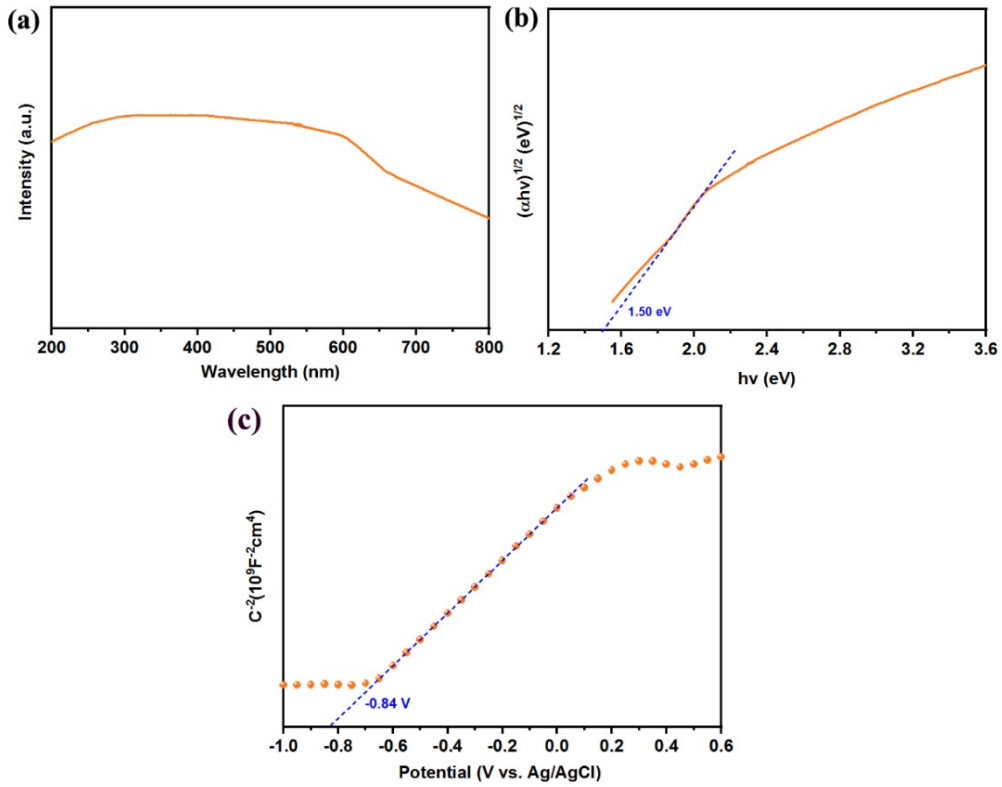


Fig. S6. (a) UV–vis diffuse reflectance spectra of $MoSe_2$ NSs-10; (b) Tauc plot of $MoSe_2$ NSs-10 derived from the absorption spectra; (c) The Mott-Schottky plot of $MoSe_2$ NSs-10.