**Supporting Information**

**Tunable Defect-engineered Nanohybrid Heterostructures: Exfoliated 2D WSe$_2$-MoS$_2$ Nanohybrid Sheet Covered on 1D ZnO Nanostructures for Self-Powered UV Photodetectors**

Adhimoorthy Saravanan [a*], Bohr-Ran Huang[a*], Deepa Kathiravan[a], Shikha Sakalley[bc], Sheng-Chi Chen[cd*]

[a] Graduate Institute of Electro-Optical Engineering and Department of Electronic and Computer Engineering, National Taiwan University of Science and Technology, Taipei 106, Taiwan.

[b] Department of Mechanical Engineering, National Taiwan University of Science and Technology, Taipei 106, Taiwan.

[c] Department of Materials Engineering and Center for Plasma and Thin Film Technologies, Ming Chi University of Technology, New Taipei city 243, Taiwan.

[d] College of Engineering and Center for Green Technology, Chang Gung University, Taoyuan 333, Taiwan.

*Corresponding authors:

E-mail addresses: huangbr@mail.ntust.edu.tw, aksaravanan@mail.ntust.edu.tw, chensc@mail.mcut.edu.tw
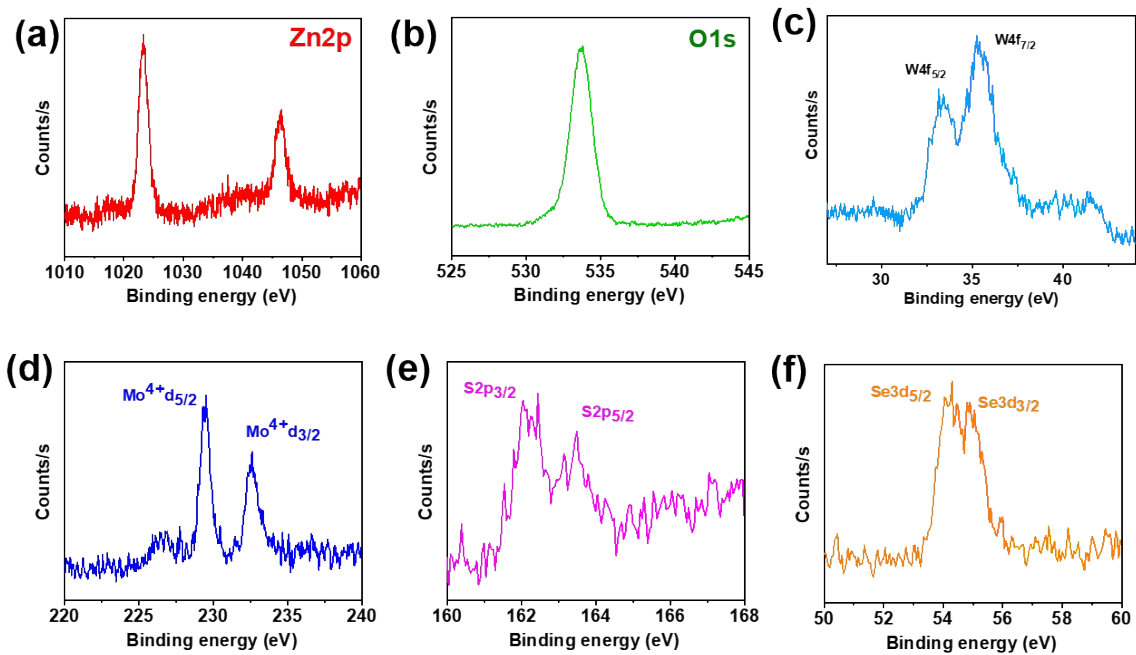
Fig. S1 XPS images of WSe$_2$ @MoS$_{2 \ (3mL)}$-ZNRs with different elements (a) Zn2p, (b) O1s, (c) Wf, (d) Mod, (e) S2p and (f) Se3d
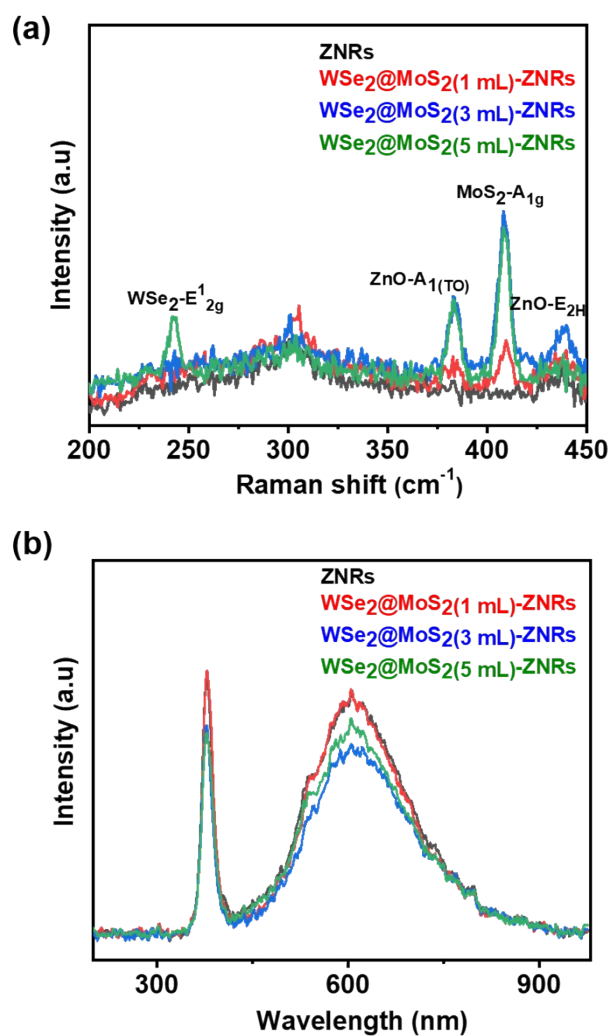
Fig. S2 (a) Raman and (b) PL spectra of ZNRs, $WSe_2$ @$MoS_{2\,(1mL)}$-ZNRs, $WSe_2$ @$MoS_{2\,(3mL)}$-ZNRs and $WSe_2$@$MoS_{2\,(5mL)}$-ZNRs

Table S1. Statistic current value of the as-fabricated samples

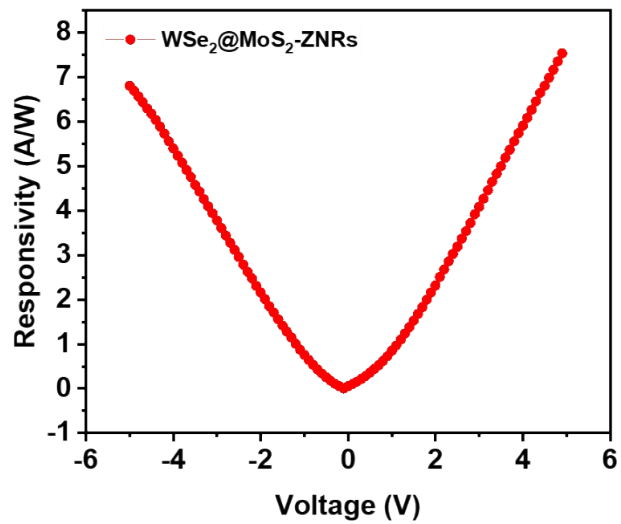| Voltage | ZNRs | | 1ml $WSe_2$@$MoS_2$-ZNRs | | 3ml $WSe_2$@$MoS_2$-ZNRs | | 5ml $WSe_2$@$MoS_2$-ZNRs | |
|---|---|---|---|---|---|---|---|---|
| | dark | UV | dark | UV | dark | UV | dark | UV |
| 1 | 2.49E-07 | 8.87E-05 | 5.28E-08 | 2.91E-04 | 9.43E-09 | 0.00016 | 5.99E-08 | 1.53E-04 |
| 2 | 5.70E-07 | 1.91E-05 | 1.08E-07 | 6.68E-04 | 3.04E-08 | 0.00216 | 3.13E-07 | 4.27E-04 |
| 3 | 9.81E-07 | 2.87E-05 | 1.84E-07 | 0.00113 | 9.53E-08 | 0.00341 | 6.97E-07 | 8.74E-04 |
| 4 | 1.54E-06 | 3.79E-04 | 2.80E-07 | 0.00157 | 2.22E-07 | 0.00574 | 1.59E-06 | 0.00161 |
| 5 | 2.22E-06 | 1.85E-04 | 4.03E-07 | 0.0024 | 4.48E-07 | 0.00754 | 2.41E-06 | 0.00276 |

Fig. S3 Responsivity values of the as-fabricated 3ml $WSe_2@MoS_2$-ZNRs sample