

Supplementary Information

Synergistic 2D MoSe₂@WSe₂ Nanohybrid Heterostructure towards Superior Hydrogen Evolution and Flexible Supercapacitor

Alkesh B. Patel^{1,2}†, Jayraj V. Vagasiya³†, Payal Chauhan¹, C. K. Sumesh⁴, Vikas Patel⁵, Saurabh S. Soni^{3*}, Kireetkumar D. Patel^{1*}, Parveen Garg⁶, Gunvant K. Solanki¹, Vivek. M. Pathak¹*

¹Department of Physics, Sardar Patel University, Shahid Chowk, Vallabh Vidyanagar, Anand, Gujarat, India - 388 120.

²Department of Paramedical Science, Charotar Institute of Paramedical Sciences, CHARUSAT Campus, Highway 139, Off. Nadiad-Petlad Road, Changa, Gujarat, India - 388421.

³Department of Chemistry, Sardar Patel University, Vallabh Vidyanagar-388 120, Gujarat, India.

⁴Department of Physical Sciences, P. D. Patel Institute of Applied Science, CHARUSAT Campus, Highway 139, Off. Nadiad-Petlad Road, Changa, Gujarat, India - 388421.

⁵Sophisticated Instrumentation Centre for Applied Research and Testing (SICART), Mota Bazaar, Vallabh Vidyanagar, Anand, Gujarat, India - 388 120.

⁶UGC-DAE Consortium for Scientific Research, University Campus, Khandwa Road, Indore, India - 452001.

*Corresponding authors

E-mail address: Alkesh B. Patel (patelalkesh51@yahoo.co.in)

Prof. K. D. Patel (kdptflspu@gmail.com)

Prof. S. S. Soni (soni_b21@yahoo.co.in),

† Authors have contributed equally to this manuscript.

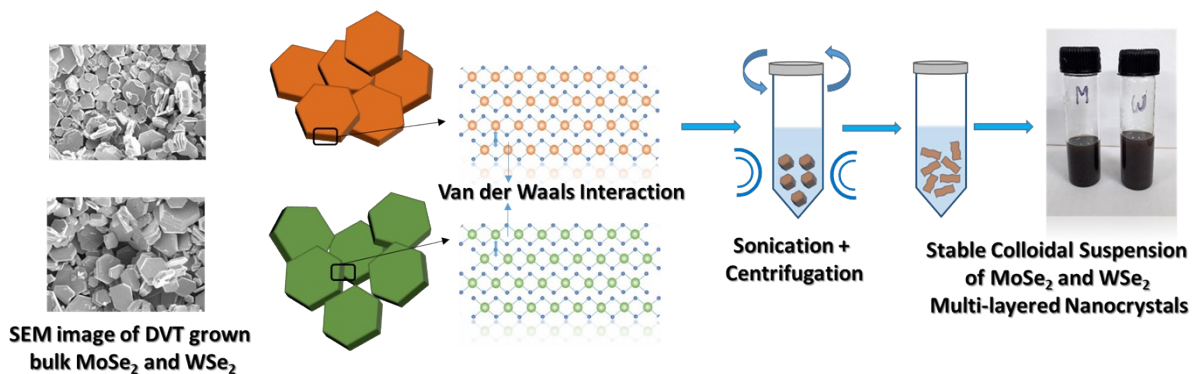


Figure S1. Schematic representation of liquid phase exfoliation of DVT grown bulk MoSe_2 and WSe_2 to obtain multi-layered nanocrystals.

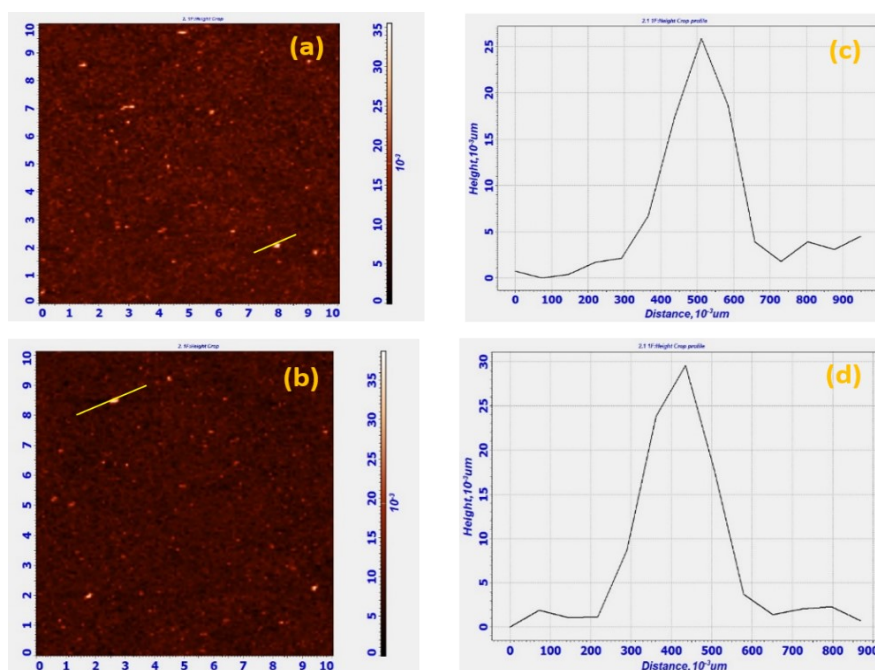


Figure S2. 2D AFM scan images of (a) MoSe_2 and (b) WSe_2 nanocrystals drop casted on mica sheet, corresponding height profile plot of (c) MoSe_2 and (d) WSe_2 corresponds to selected line scan.

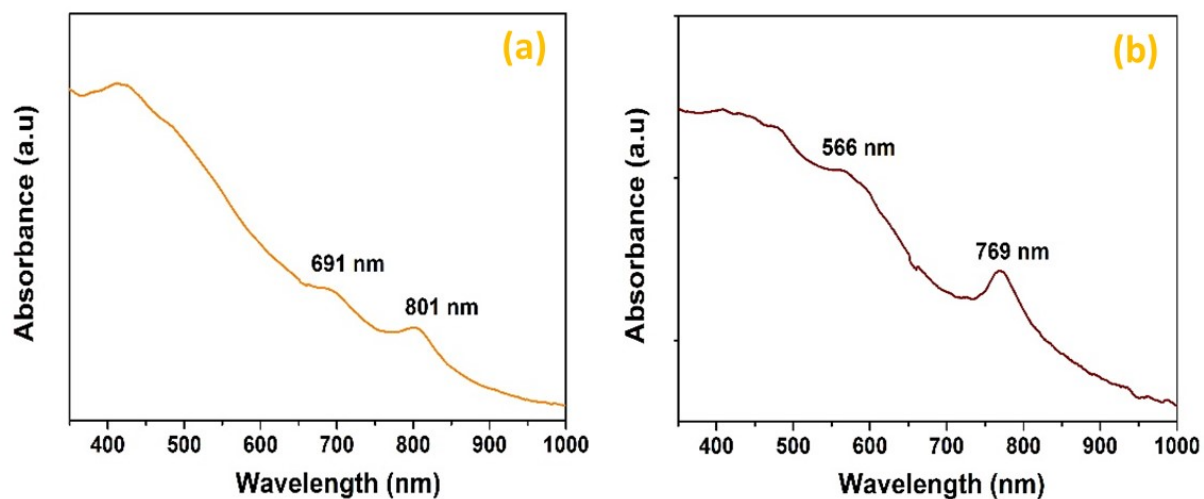


Figure S3. UV-visible absorption spectra of (a) MoSe₂ and (b) WSe₂ nanocrystals colloidal suspension.

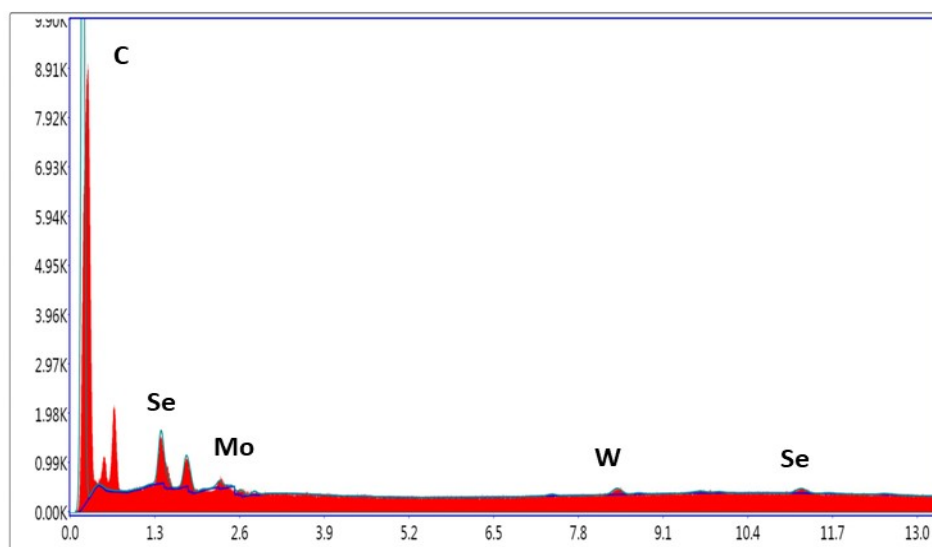


Figure S4. EDAX spectra of MoSe₂@WSe₂ HS on single CF.

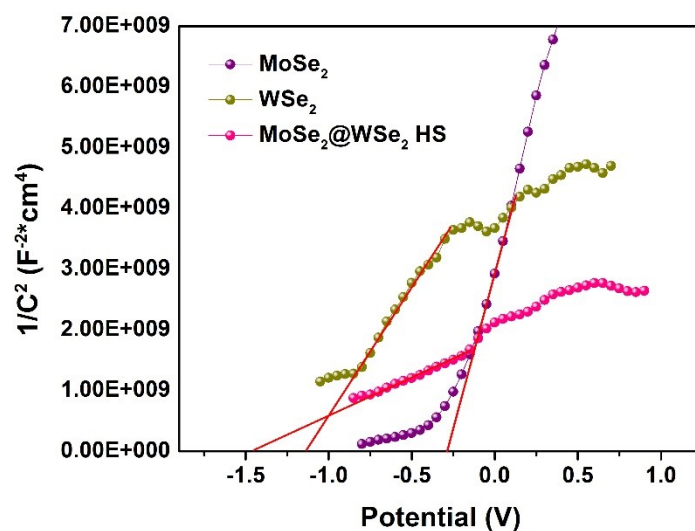


Figure S5. M-S plot of MoSe₂, WSe₂, MoSe₂@WSe₂ HS.

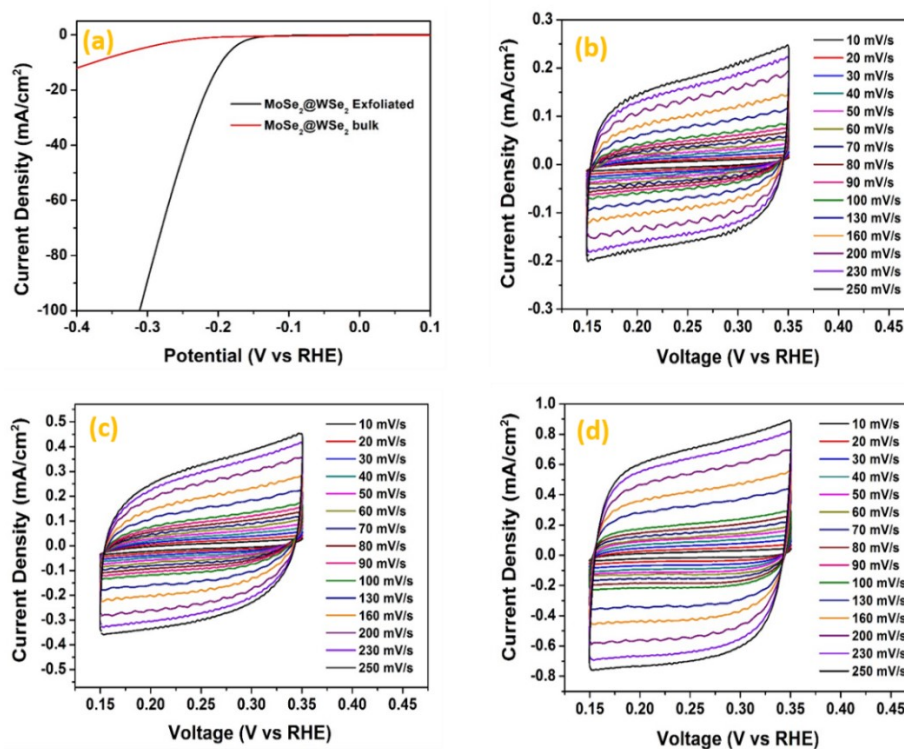


Figure S6. (a) The LSV curve of bulk and nanocrystals based MoSe₂@WSe₂ HJ composite. The cyclic voltamogram of (b) WSe₂, (c) MoSe₂ and (d) MoSe₂@WSe₂ HJ electrode as a function of various scan rate (10 mV.s⁻¹ – 250 mV.s⁻¹).

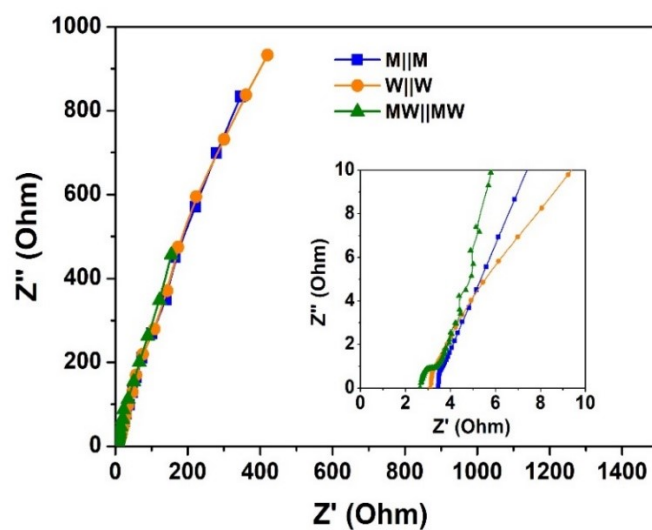


Figure S7. Nyquist plots of M||M, W||W and MW||MW FSCs (inset magnify of high frequency region).