Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.


**Supplementary Information**

# Electric field induced switching of anomalous Nernst conductivity in 2D $MoTe_2/VSe_2$ heterostructure

Brahim Marfoua and Jisang Hong*

Department of Physics, Pukyong National University, Busan 48513, Korea

**Corresponding Authors**

**E-mail: hongj@pknu.ac.kr*

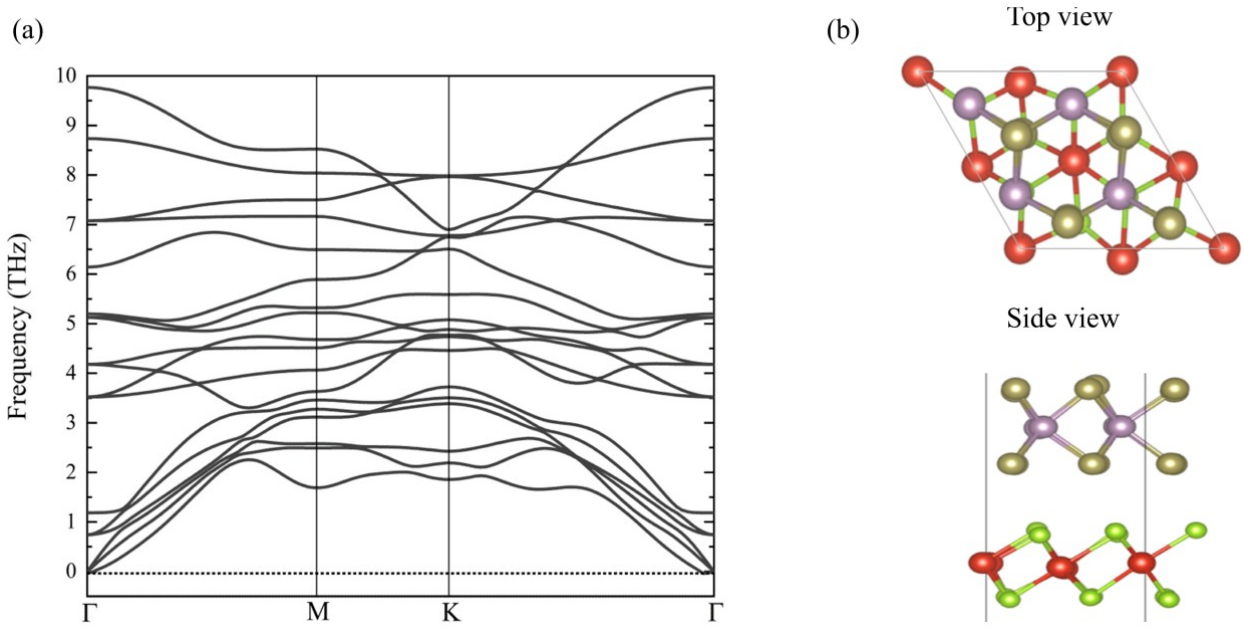


**Fig. S1** (a) calculated phonon dispersion of the $MoTe_2/VSe_2$ heterostructure. (b) Top and side views snapshot of the molecular dynamics simulations of the $MoTe_2/VSe_2$ heterostructure at 300 K up 5 ps.

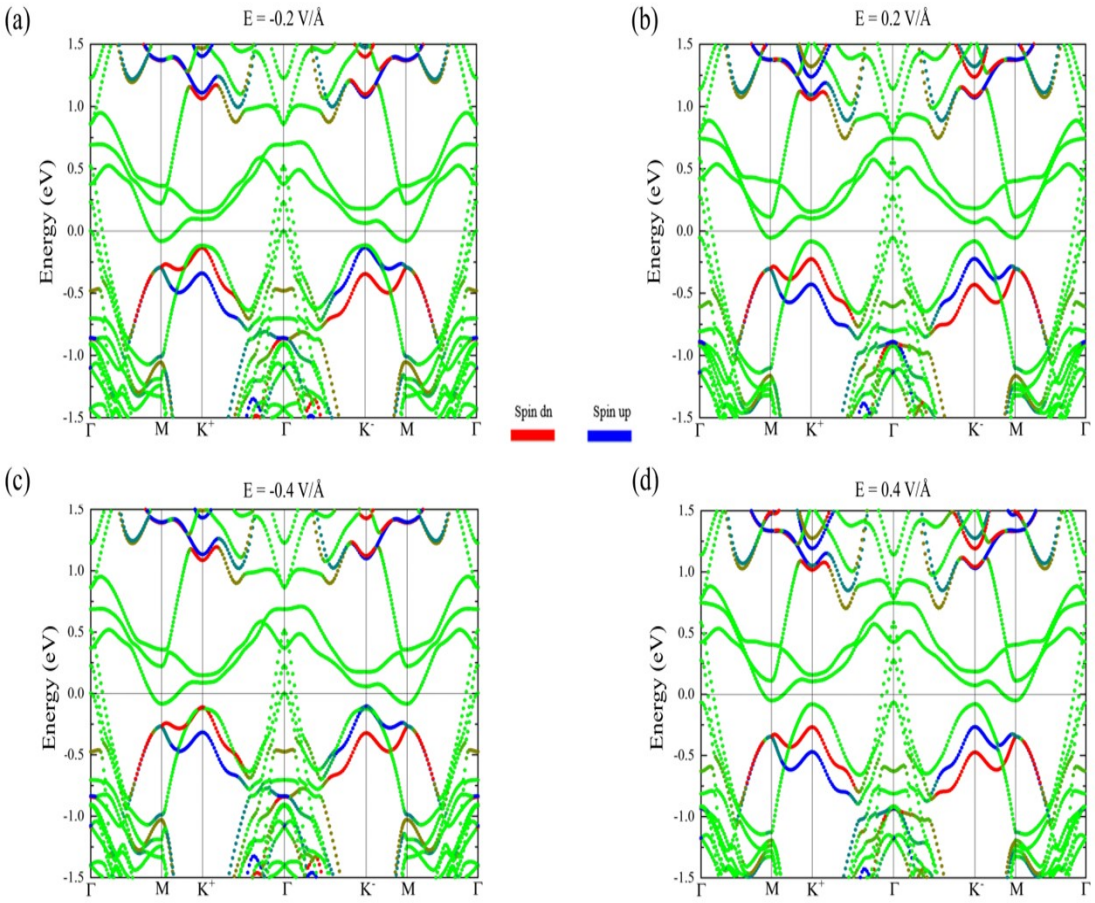


**Fig. S2** Electric field dependent SOC band structure of the $MoTe_2/VSe_2$ heterostructure at (a) E = -0.2 V/Å, (b) E = 0.2 V/Å, (c) E = -0.4 V/Å and (d) E = 0.4 V/Å. Here, the green line represents the contribution from the $VSe_2$ layer while the blue line represents the majority spin component and the red line is the minority spin component from the $MoTe_2$ layer.

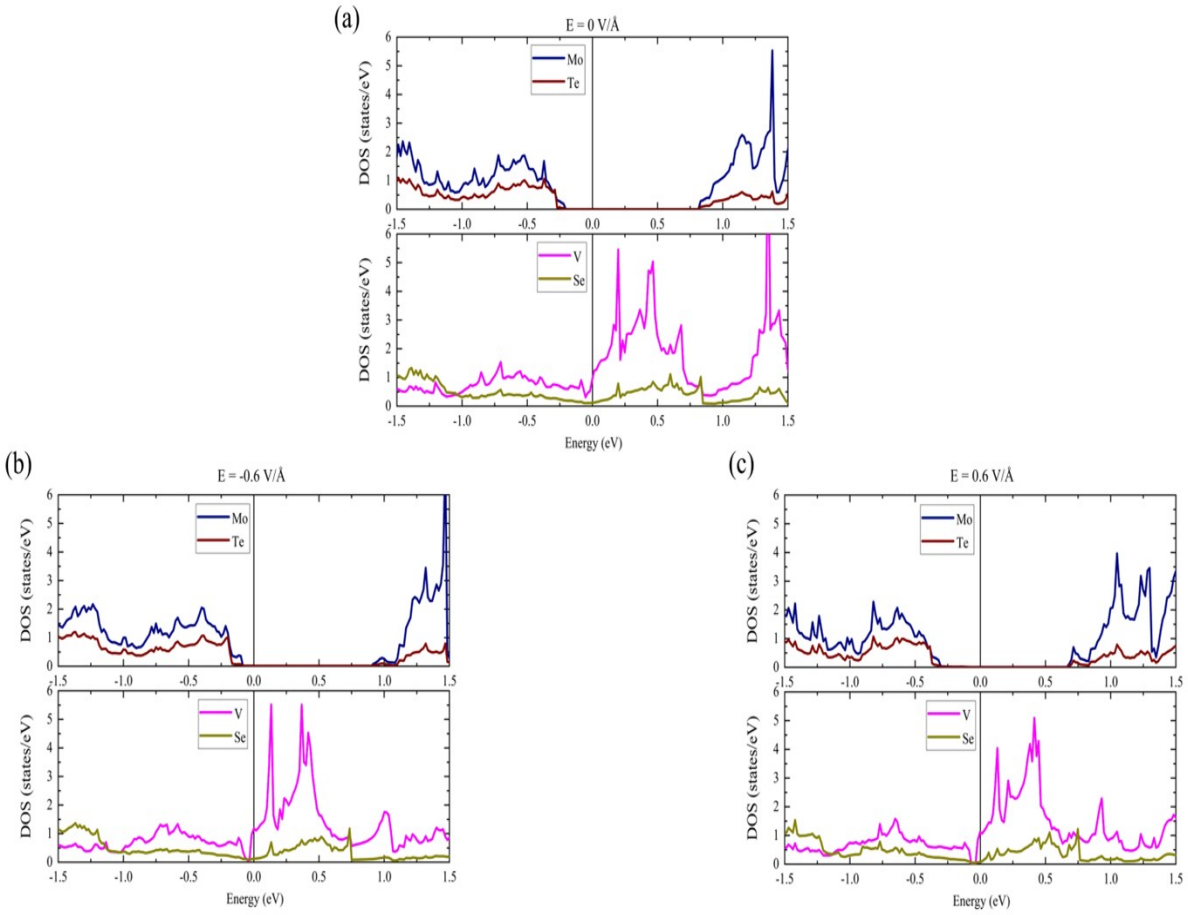


**Fig. S3** Layer dependent density of states (DOS) of $MoTe_2/VSe_2$ heterostructure at (a) E = 0 V/Å, (b) E = -0.6 V/Å, and (c) E= 0.6 V/Å.

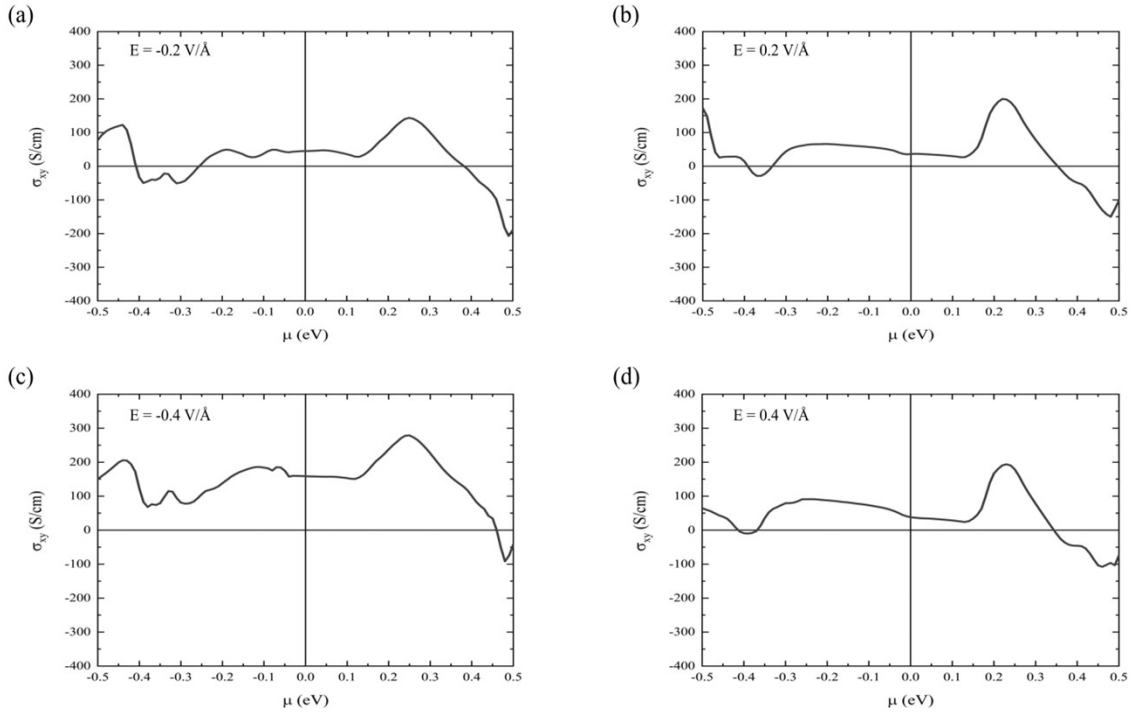


**Fig. S4** Electric field dependent anomalous Hall conductivity ($\sigma_{xy}$) as a function of chemical potential ($\mu$) at (a) E = -0.2 V/Å, (b) E = 0.2 V/Å, (c) E = -0.4 V/Å and (d) E = 0.4 V/Å .

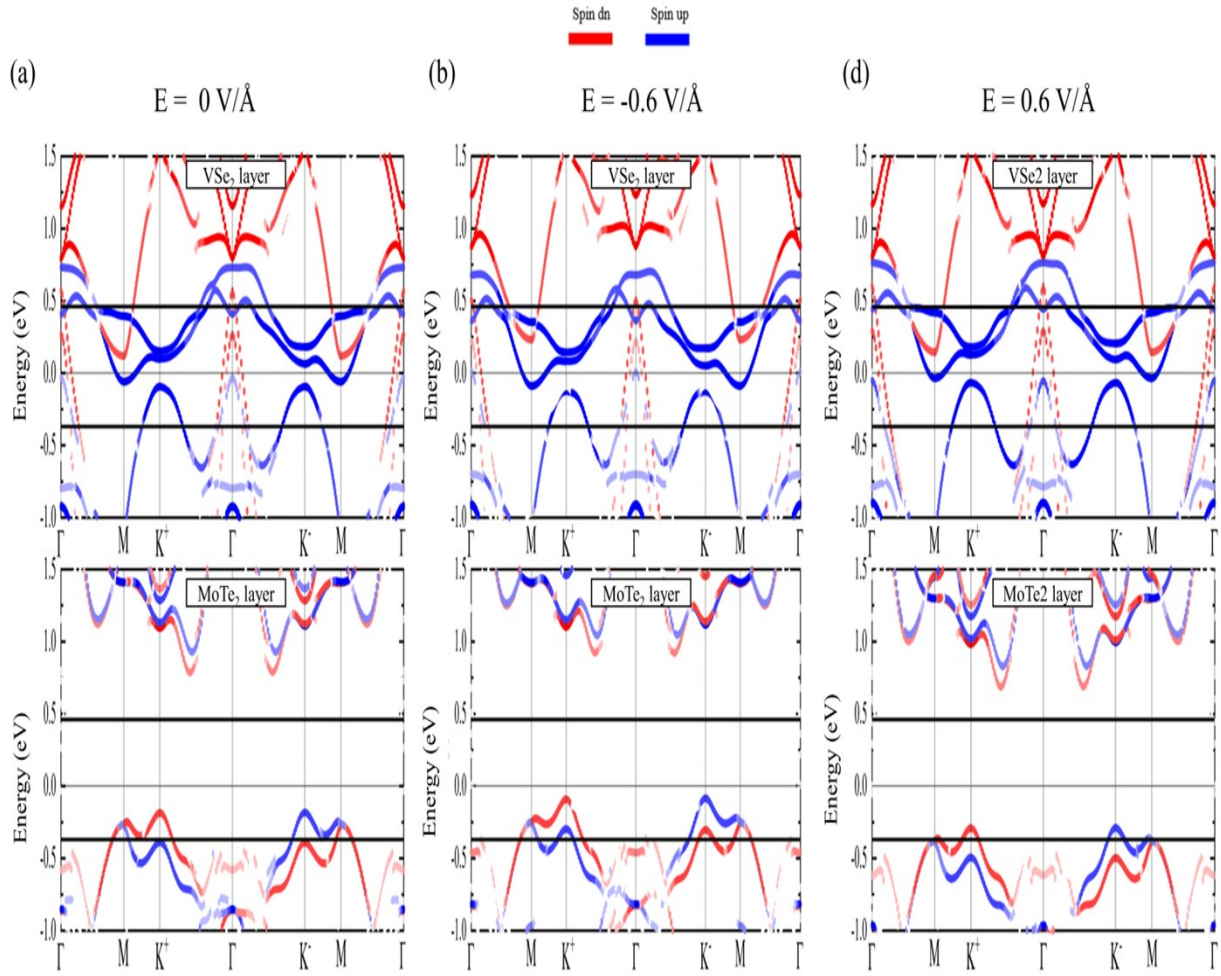


**Fig. S5** Layer dependent projected SOC band structure of $MoTe_2/VSe_2$ heterostructure at (a) E = 0 V/Å, (b) E = -0.6 V/Å, and (c) E= 0.6 V/Å. Here, the blue line represents the majority spin component and the red line is the minority spin component.

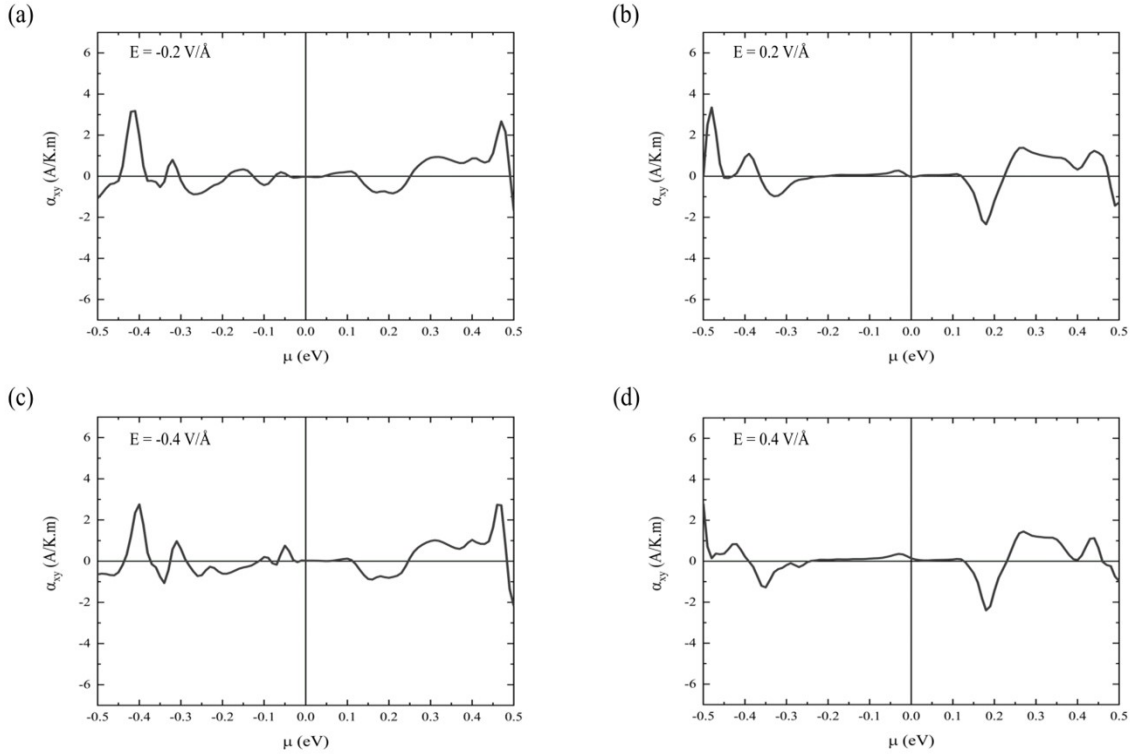


**Fig. S6** Electric field dependent anomalous Nernst conductivity ($\alpha_{xy}$) as a function of chemical potential (μ) at (a) E = -0.2 V/Å, (b) E = 0.2 V/Å, (c) E = -0.4 V/Å and (d) E = 0.4 V/Å .