

Supporting Information for

Tunable valley splitting in VTe_2/Ga_2S_3
antiferromagnetic/ferroelectric heterostructures

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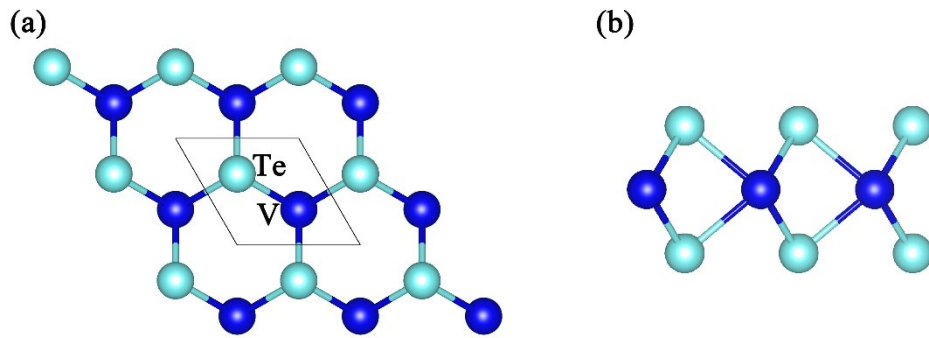


Fig. S1 (a) and (b) The top view and side view of VTe₂ monolayer, respectively. The blue and azure balls represent the V and Te atoms, respectively.

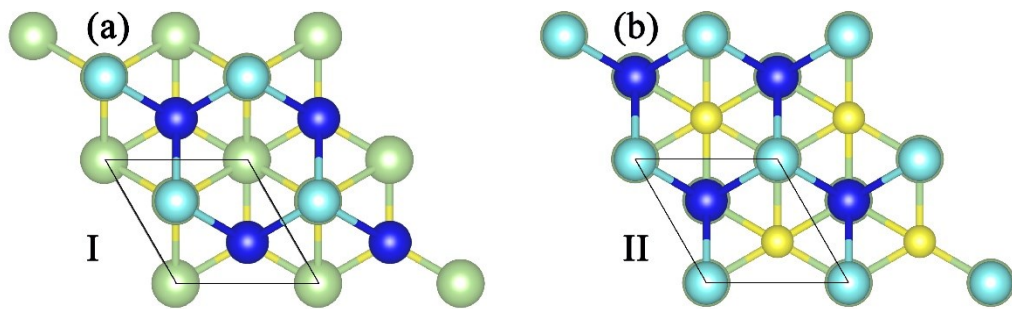


Fig. S2 The heterostructure of antiferrovalley bilayer VTe₂ and Ga₂S₃ monolayer of label I (a) II (b) in main text.

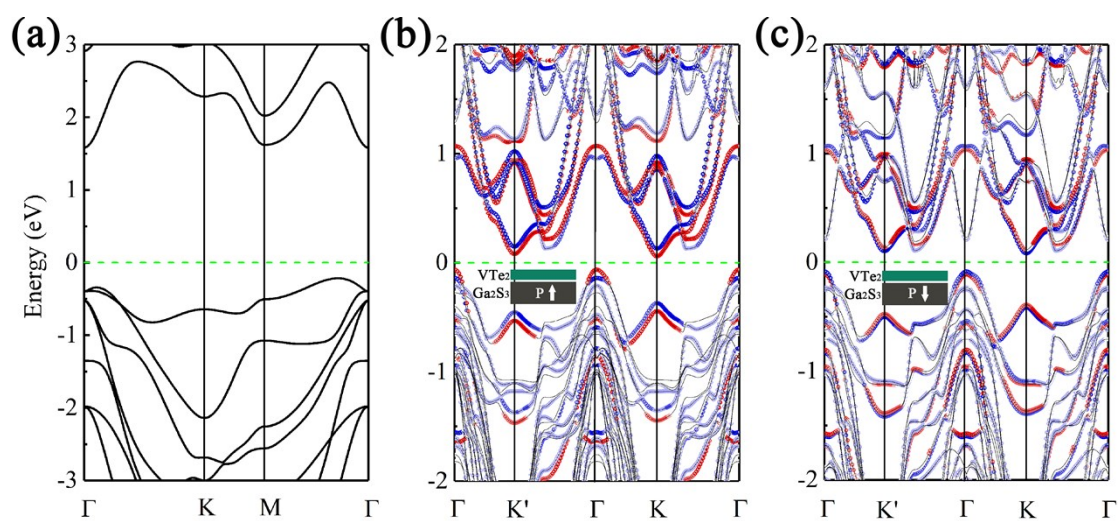


Fig. S3 (a) The band structure of pristine Ga_2S_3 monolayer. (b) and (c) The band structures of heterostructure $\text{VTe}_2/\text{Ga}_2\text{S}_3$ with opposite direction of ferroelectric polarization. The circles represent the VTe_2 component and the red and blue represent the spin up and spin down. The insets in (a) and (b) are schematic of our system with opposite ferroelectric polarization.

Table SI The parameters (in eV) of the $k\cdot p$ model of the $\text{VTe}_2/\text{Ga}_2\text{S}_3$ heterostructures obtained by fitting the DFT band structures. n is the layer numbers of the ferroelectric substrate. The parameters of the upper and lower layers of the VTe_2 bilayer are presented, respectively.

Δ	t_{12}	λ_c	λ_v	M_c	M_v
0.361	0.313	-0.010	0.043	0.546	0.710

n	ϵ		t_{cc}		t_{vv}		U	
	<i>upper</i>	<i>lower</i>	<i>upper</i>	<i>lower</i>	<i>upper</i>	<i>lower</i>	<i>upper</i>	<i>lower</i>
1	0.500	0.500	0.170	0.170	0.297	0.297	0.077	-0.036
2	0.450	0.653	0.190	0.170	0.297	0.287	0.117	-0.079
3	0.437	0.656	0.194	0.170	0.297	0.287	0.130	-0.091
4	0.430	0.658	0.194	0.170	0.297	0.287	0.141	-0.105