Supplementary Information

Electric Field Tunable Half-Metallic Characteristic at $Fe_3O_4/BaTiO_3$ Interfaces

Xueyao Hou[1], Xiaocha Wang[2], Guifeng Chen[3], Wenbo Mi[1,1]

[1]Tianjin Key Laboratory of Low Dimensional Materials Physics and Preparation Technology & Key Laboratory of Advanced Ceramics and Machining Technology of Ministry of Education, Faculty of Science, Tianjin University, 300354, Tianjin, China

[2]School of Electronics Information Engineering, Tianjin University of Technology, 300384, Tianjin, China

[3]School of Material Science and Engineering, Hebei University of Technology, 300130, Tianjin, China

[*]Author to whom all correspondence should be addressed.

E-mail: miwenbo@tju.edu.cn

Table. S1. Bader charges of bulk Fe_3O_4, TiO-Fe_BO (solid lines) and OTi-Fe_BO (dash lines).

Bader charge (e)	unstrained FO	5% FO	TiO-Fe_BO	OTi-Fe_BO
O	-0.81	-0.80	-1.09	-1.11
Fe_A	+1.49	+1.62	1.65	1.61
Fe_B	+1.65	+1.59	1.62	1.50

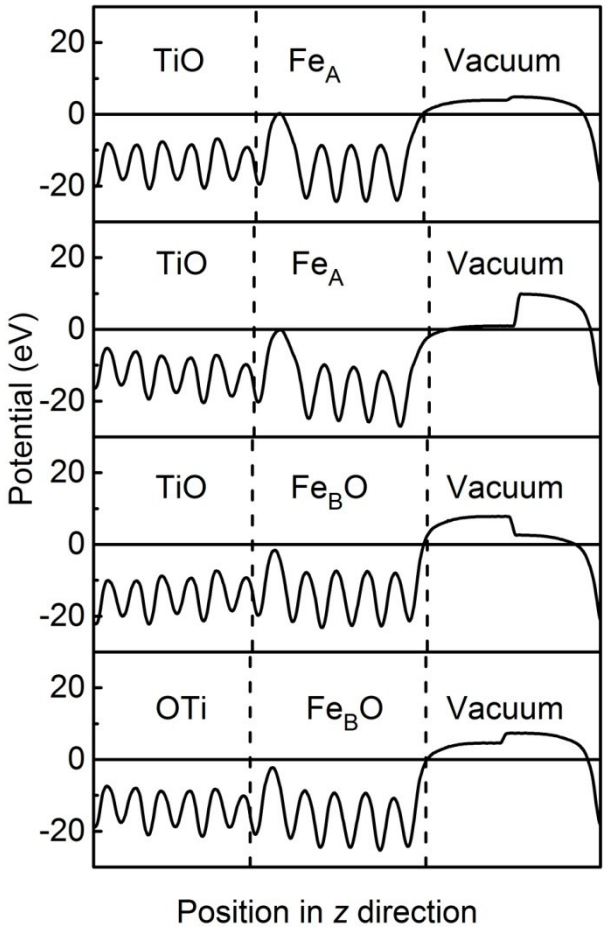

Fig. S1. The potentials of TiO-Fe$_B$O and OTi-Fe$_B$O along *z* direction.

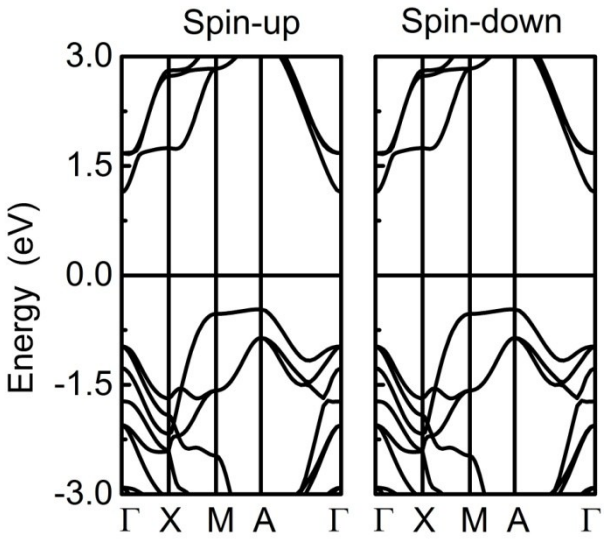

Fig. S2. The spin-resolved band structure of bulk $BaTiO_3$, the high-symmetry points are Γ (0, 0, 0), X (0, 0.5, 0), M (0.5, 0.5, 0), A (0.5, 0.5, 0.5).

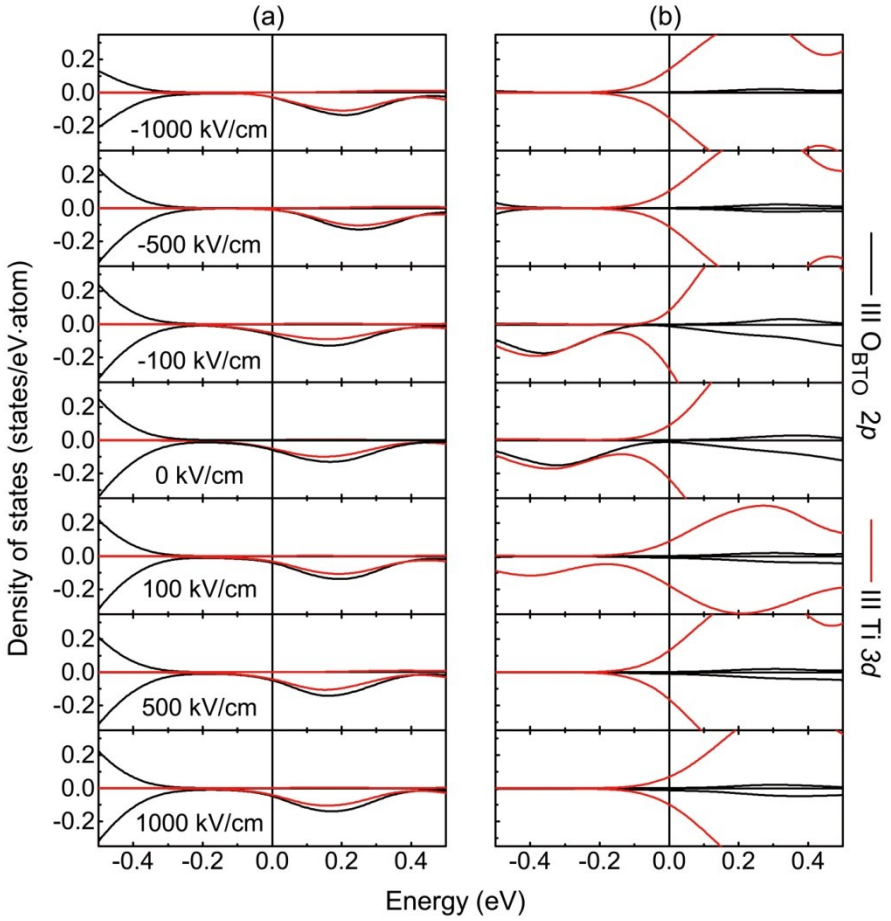

Fig. S3. DOS of the III-O and III-Ti of the two models with different electric fields, the color of line were plot on the right.

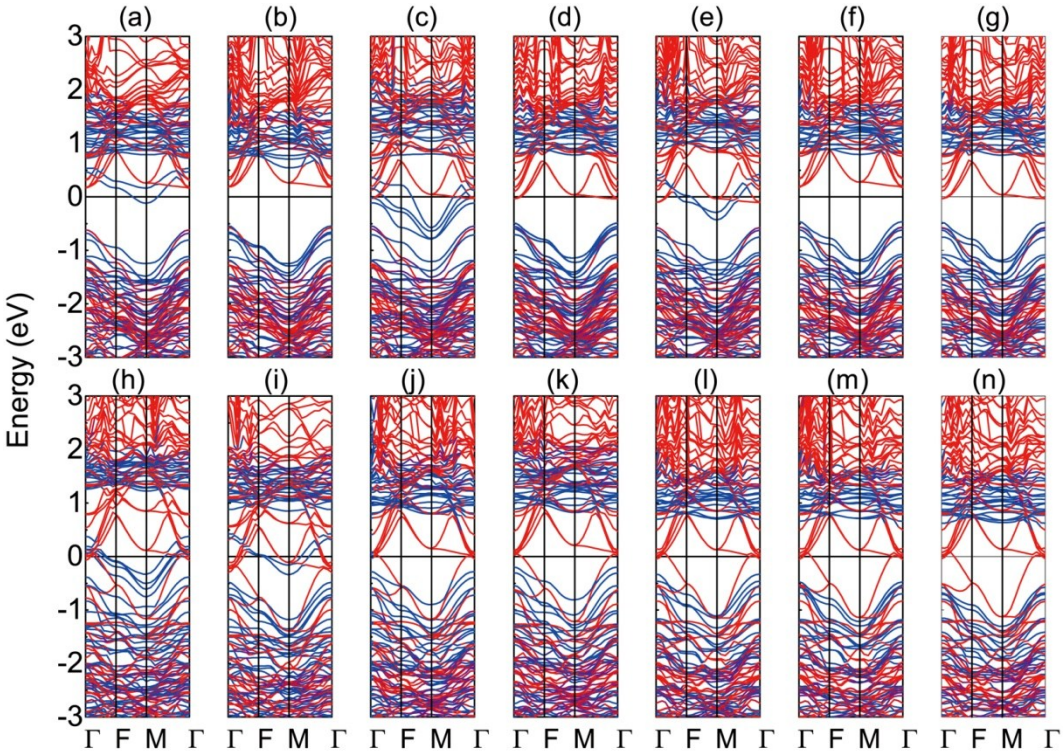

Fig. S4. The spin-up band structures of TiO-Fe_BO (top panel) and OTi-Fe_BO (bottom panel) with different electric fields.

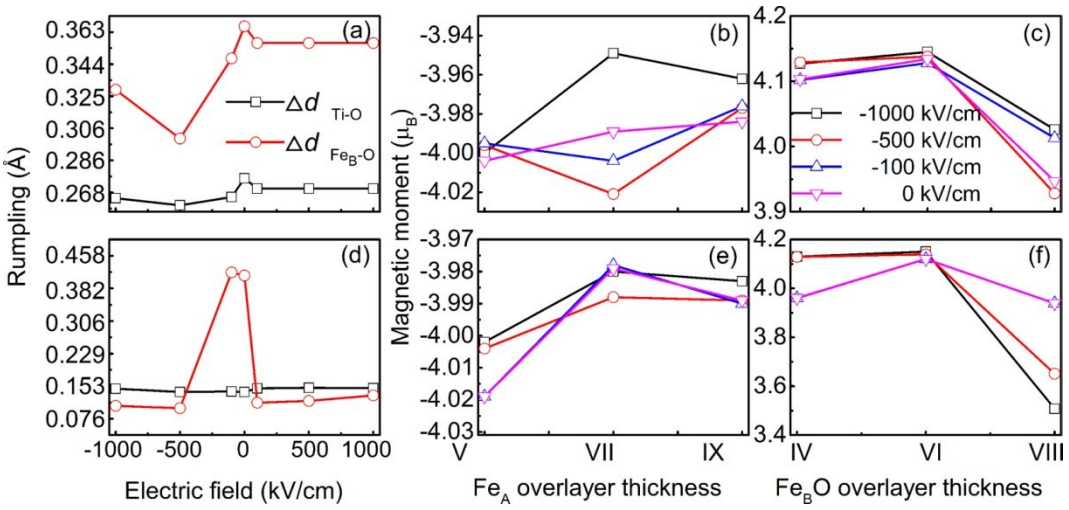

Fig. S5. (a), (d) The displacements of TiO and Fe_BO of TiO-Fe_BO and TiO-Fe_BO with different electric fields; (b) or (c) is M_{FeA} (M_{FeB}) as functional of layers in TiO-Fe_BO with different electric fields; (e), (f) are responding M_{FeA} (M_{FeB}) in OTi-Fe_BO.