Interfacial Ferroelectricity by van der Waals Sliding

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Abstract

Despite their partial ionic nature, many layered diatomic crystals avoid internal electric polarization by forming a centrosymmetric lattice at their optimal van-der-Waals stacking. In my talk, I will present a stable ferroelectric order emerging at the interface between two naturally-grown flakes of hexagonal-boron-nitride, which are stacked together in a metastable non-centrosymmetric parallel orientation. We observe alternating domains of inverted normal polarization, caused by a lateral shift of one lattice site between the domains. Reversible polarization switching coupled to lateral sliding is achieved by scanning a biased tip above the surface. Our calculations trace the origin of the phenomenon to a subtle interplay between charge redistribution and ionic displacement, and our minimal cohesion model predicts further venues to explore the unique "slidetronics" switching.

References

[1] M. Vizner Stern et al.," Interfacial ferroelectricity by van der Waals sliding" Science.10.1126/science.abe8177 (2021) (DOI: 10.1126/science.abe8177)

Figures

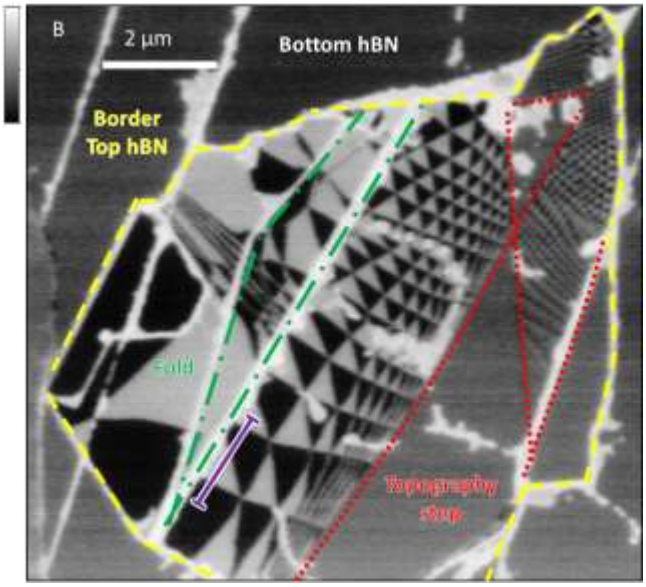

Figure 1: Surface potential map showing oppositely-polarized domains (black & white)

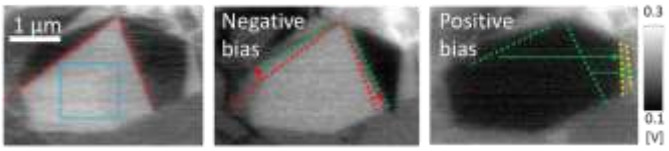

Figure 2: Dynamic flipping of polarization orientation by domain-wall sliding.