Dissipation mechanisms of topological insulators

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Abstract

Mechanical dissipation measurements by pendulum atomic force microscopy (pAFM) show increased energy losses at discrete separations and voltages up to distances of 14nm. Combined STM/pAFM measurements reveal that the Gundlach oscillations are accompanied by increased mechanical dissipation. Therefore, we interpret the enhanced dissipation losses at discrete separations and voltages to charge fluctuations of the Image Potential States (IPS). Tunneling processes lead to occupancy and de-occupancy of the IPS, which is detected by pAFM. If magnetic fields are applied, we do observe that Joule-type dissipation raises, which is most probably related to the destruction of the topological protection, which opens the channel for scattering to bulk states giving rise to increased Joule dissipation as it is more common on ordinary metallic surfaces [1].

References

[1] Yildiz, D., Kisiel, M., Gysin, U. et al. Mechanical dissipation via image potential states on a topological insulator surface. Nat. Mater. 18, 1201–1206 (2019). https://doi.org/10.1038/s41563-019-0492-3Authors, Journal, Issue (Year) page

Figures

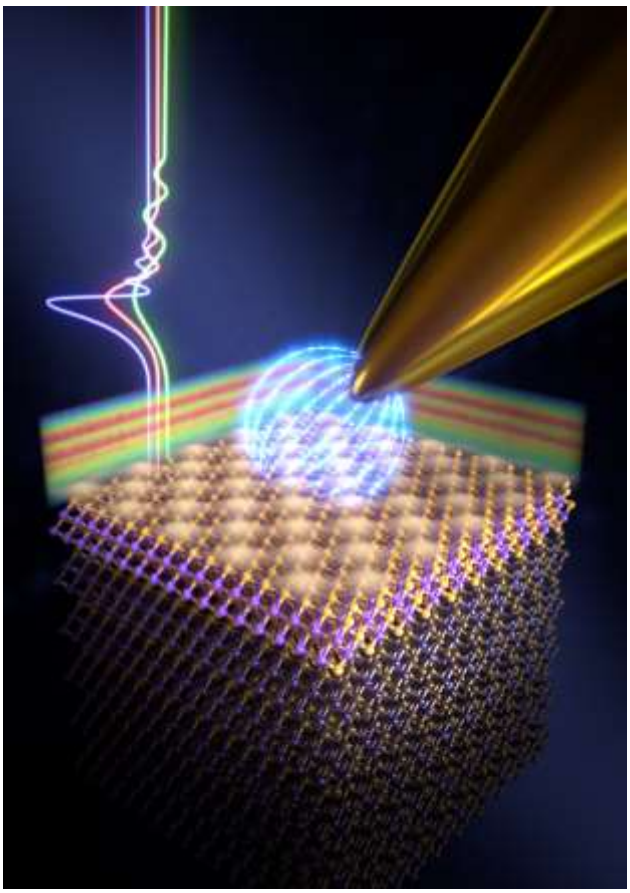

Figure 1: Tunneling processes via image potential states lead to mechanical dissipation at discrete energies.