Symmetry-Enforced Nodal Lines in Nonsymmorphic Bilayers

Lucas Lopes Lage[1]
Mariana Malard[2]
Andrea Latgé[1]

[2] *Faculdade UnB Planaltina, Universidade de Brasília, Brasília, DF 70904-910, Brazil.*
[1] *Instituto de Física, Universidade Federal Fluminense, Niterói, Av. Litorânea sn 24210-340, RJ-Brazil,*

lucaslage@id.uff.br

The synthesis of atom-thin materials has inaugurated a new era of nanodevice engineering, where the interaction between layers provides a playground for emergent physical phenomena [1]. While twistronics has dominated recent literature, the emerging field of slidetronics offers a distinct degree of freedom for tuning electronic states through lateral real-space displacement [2,3]. In this work, we investigate the topological evolution of band structures in bilayer systems, specifically focusing on the transition of the Fermi surface across discrete transformations in real space. By employing symmetry group analysis, we demonstrate that the emergence of nodal lines (NLs) is fundamentally linked to nonsymmorphic stacking configurations [4,5]. Fermi sea topology is quantified using the Euler characteristic marking a topological transition across an experimental feasible mechanism of displacement between the layers. The intricate interplay between the proposed Van der Waals materials in this work are modeled with ab initio parametrized by a tight-binding model considering long range interactions.

References

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Figures

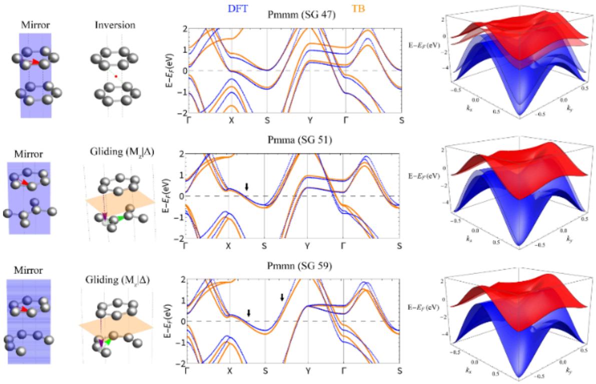

Figure 1: Stacking configurations and respective electronic band structures. Sliding induced topological transition with symmetry-enforced NLs in biphenylene nonsymmorphic stacking.