

Realization of correlated and topological electronic states in crystalline graphene

Guorui Chen 

School of Physics and Astronomy, Shanghai Jiao Tong University, Shanghai, China

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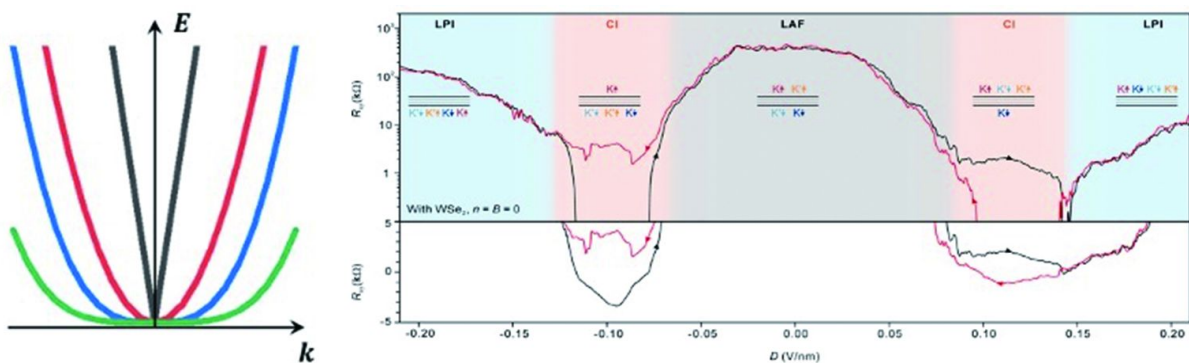
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Author introduction

Guorui Chen is an associate professor of physics at Shanghai Jiao Tong University. He got his B.S. degree from Shandong University, and Ph.D. degree from the Department of Physics of Fudan University. From 2017 to 2020, he worked at the University of California, Berkeley and Lawrence-Berkeley National Lab as a postdoc fellow. His research interests lie in electrical transport study of emergent phenomenon, especially interplay between correlation and topology, in two-dimensional materials and their heterostructures.

Highlights

- ◆ ABC-stacked multilayer graphene is a correlated crystalline material.
- ◆ A correlated insulator is discovered in ABC-stacked graphene starting from tetralayer.
- ◆ A topological Chern insulator is realized at charge neutrality of ABCA-tetralayer graphene with proximitized spin-orbit coupling.



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Abstract Electron-electron interactions can be significant in graphene with an ABC-stacking sequence. By developing innovative experimental techniques, we successfully fabricated high-quality ABC-stacked multilayer graphene and observed a correlated insulating state at charge neutrality, beginning with ABCA-tetralayer. Furthermore, by introducing proximity-induced spin-orbit coupling, at the charge neutrality point of ABCA-tetralayer, we achieved a topological Chern insulator with a layer-number-dependent Chern number of four.

Keywords layer stacking, multilayer graphene, strong correlation, Chern insulator

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