Superconductivity in Twisted Bilayer Graphene

Morgan Martin
PhD
Delft University of Technology
Mekelweg 5, 2628 CD Delft, Netherlands

Kim White
Prof.
University of Bologna
Via Zamboni, 33, 40126 Bologna BO, Italy

Drew Campbell
Dr.
University of São Paulo
Av. Prof. Luciano Gualberto, 380 - Butantã, São Paulo - SP, 05508-010, Brazil

Abstract. This paper explores the phenomenon of superconductivity in twisted bilayer graphene. The study investigates the electronic properties that emerge when graphene layers are slightly rotated relative to each other. Using advanced computational methods, the research uncovers the conditions under which superconductivity can be induced, offering insights into the design of new quantum materials with high superconducting transition temperatures.

Keywords: Superconductivity, Twisted Bilayer Graphene, Quantum Materials, Electronic Properties, Computational Physics

Introduction

Twisted bilayer graphene has emerged as a fascinating platform for studying superconductivity and other exotic electronic phenomena. By slightly rotating two layers of graphene, unique electronic properties can be engineered, leading to the emergence of superconductivity. This article delves into the mechanisms behind this phenomenon, employing state-of-the-art computational techniques to analyze the electronic structure of twisted bilayer graphene. Our research identifies critical conditions that favor superconductivity, providing a pathway for designing new quantum materials with enhanced superconducting properties.

References

1. Boynazarov, T., Ryu, D. H., Cho, A. Y., Abbas, H., & Choi, T. (2025). Flexible Hf0. 5Zr0. 5O2/La0. 7Sr0. 3MnO3 Heterostructure by Water-Etching Transfer for Tunable Multilevel RRAM in Neuromorphic Computing. Journal of Alloys and Compounds, 184383.