

Tabby graphene: realization of zigzag edge states at the interfaces.

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Tabby is a pattern of kitty's coat featuring distinctive stripes, dots, or swirling patterns. Ideally, the stripes are non-broken lines; evenly spaced. Decoration of the graphene basal plane with the stripes of attached atoms along the zigzag crystallographic directions creates the edge states at the sp^2/sp^3 interfaces.

"Zigzag" is a magic word in the graphene world: it is expected that zigzag edges qualitatively change the electronic properties, including spin magnetism. Theories predict an extended spin polarization along the graphene edges in the ground state, with opposite spin directions at opposite edges.

We have recently synthesized a novel graphene derivative decorated by monoatomic fluorine chains running in the crystallographic directions and measured strong one-dimensional magnetism in this two-dimensional material [1].

Tabbies have been realized on bilayer graphenes where the bipartite lattice creates a discriminating mechanism leading to the formation of regular stripy patterns whereas crossing and branching are suppressed.

[1]. Makarova, T. L. et al., Scientific Reports 5, 13382 (2015).