Namur Institute of Structured Matter

UNIVERSITÉ DE NAMUR

Seminar

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« Strongly correlated electronic ground state in rhombohedral graphite »

When and where:

Tuesday December 7th 2021 at 11:00
Online
Teams: NISM Team, "Seminars" channel. (For externals: request link from contact)

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« Strongly correlated electronic ground state in rhombohedral graphite »

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In crystalline solids the interactions of charge and spin can result in a rich variety of emergent quantum ground states. A prime example is twisted bilayer graphene, where recent measurements have demonstrated the presence of superconductivity, ferromagnetism, and Mott insulator quantum states.

The origin of these quantum states is related to the enhanced correlation effects of the partially filled flat bands in the system. Rhombohedral graphite (RG) is perhaps the simplest and structurally most perfect condensed matter system to host a flat band, which is also protected by the symmetry. In this seminar we will provide detailed investigation of the flat band in RG by using low temperature Scanning Tunneling Microscopy (STM) measurements combined with electronic structure calculations [1].

We measured the flat surface band of 8 and 10 layers of RG at various charge densities and find correlated behavior up to a temperature of 20 K. At charge neutrality we also identified a degenerate ground state, forming a competing domain structure between a sublattice antiferromagnetic insulator and a gapless, correlated paramagnet. Our density-matrix renormalization group (DMRG) calculations explained this observation by revealing a degenerate ground state of the system. Our work establishes RG as a new platform to study many-body interactions beyond the mean-field approach in a topological electron system. [1] I. Hagymási et al., Observation of strongly correlated, degenerate ground states in the flat band of rhombohedral graphite. Nature, under review (2021).