Novel Two-Dimensional Magnets Synthesized in Graphene Oxide Under Ambient Conditions: Atomic Structure and Magnetic Properties

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We have recently developed a simple chemical method SinGO (Synthesis in Graphene Oxide) that, under ambient conditions, can provide novel two-dimensional (2D) materials in a macroscopic scale [1]. The SinGO method opens an avenue to a new class of 2D magnetic and non-magnetic metal-iodides (2D-MI) encapsulated between graphene monolayers. Such vdW stacks would serve as a novel platform for nanotechnological devices in which 2D magnets hold spin whereas graphene as a conducting channel of Dirac electrons can guide the encoded relevant information. Noting that graphene spintronics has been aiming to exploit the extraordinary Dirac electronic properties but weak spin orbit-coupling limits its applicability for generating spin currents or spin torques. The proximity-induced spin-orbit coupling and exchange interactions in graphene-encapsulated 2D-MI magnets heterostructure might enable spin transport with unexplored yet physical mechanisms.

Here we will present the wide range characterization of 2D (magnetic and non-magnetic) metal-iodides encapsulated in graphene including their atomic structures (STEM), magnetization and electrical transport properties for possible applications.

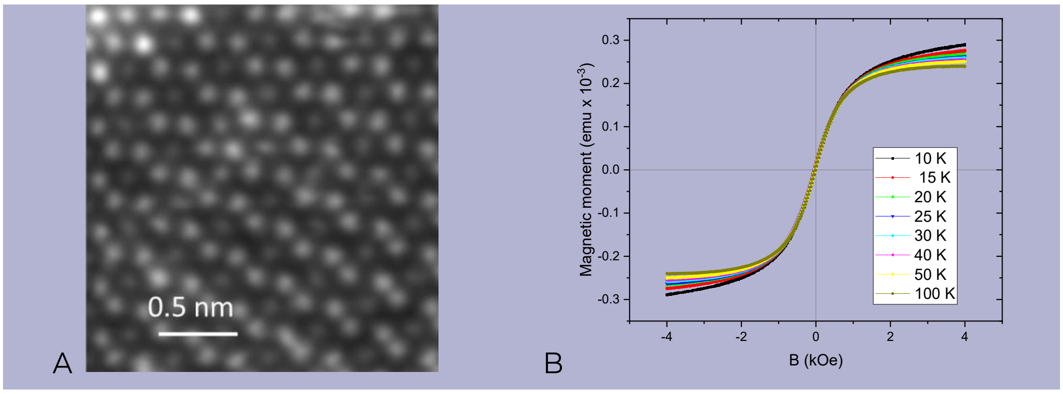

Figure 1: A. Scanning Transition Electron Micrograph of 2D FeI2 atomic structure embedded between graphene layers (carbon contrast is too low to be visible), B. Dependence of magnetization on magnetic field of 2D FeI2 - graphene heterostructure.

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References

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