Simple Synthetic Route Toward Two-Dimensional Metal Iodides

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Abstract. Graphene, as the first isolated two-dimensional (2D) structure, has a privileged position among 2D materials for its peculiar properties. The chemical inertness and simplicity of its atomic structure also makes graphene a most suitable substrate for stabilizing less obvious 2D structures. We developed a method where the 2D materials are grown by wet-chemical process directly within the space between two graphene oxide (GO) layers, while reducing the oxide groups in the same reaction step. This way, the newly formed 2D materials stay tightly encapsulated in graphene. Besides copper iodide, 2D-CuI, a material that normally only occurs in layered form at elevated temperatures between 645 and 675 K [1], a number of 2D structure like AgI, NiI2, BiI3 and EuI2 have also been demonstrated. These synthesized structures are predicted to differ by their optical, magnetic and electrical properties relevant for novel quantum technologies. Here, electron transmission microscopy (TEM) images of the atomic structure of these 2D metal iodides complemented by electron energy loss spectroscopy (EELS) and X-ray absorption spectroscopy (XAS) analyses as well as additional characterization methods will be presented. Currently, the electronic transport in devices made of the 2D metal iodide structures are under investigation.

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