

Mass Production of 2D Materials by iMAGE and Their Applications

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Abstract

Graphene and two-dimensional (2D) materials have attracted significant interest. So far, only graphene can be produced in ton level, while other 2D materials cannot, which is a key limiting factor for their commercial applications.

First, I will briefly introduce the invention of an electrolytic water oxidation process to produce graphene oxide with high quality and efficiency in large quantity [1]. Then, I will report our recent achievements in mass production of various 2D materials, including graphene, hexagonal boron nitride (h-BN), transition metal dichalcogenides (TMDCs), black phosphorene, layered complicated oxides, and many others, by a new powerful technology which we called interMediate Assisted Grinding Exfoliation (the iMAGE technology) [2]. This method can have a production capability of about ton level, and is among the most powerful and efficient methods to produce 2D materials with the highest yield, quality, and production rate. This method can also be used to produce 2D MoS₂ flakes from cheap and abundant MoS₂ minerals. Furthermore, I will introduce the mass production of functionalized 2D materials by mechanochemical exfoliation [3]. In the end, I will discuss the use of such massively produced 2D materials for energy storage and conversion, functional composites, sensors, and optoelectronics [4-6].

References

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