Large scale production of 2D-crystals-based inks and their application for energy and (opto)electronics

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Abstract
Graphene and other two dimensional (2D) crystals thanks to their excellent and complementary material properties, have the opportunity to improve the performance of existing devices or enable new ones[1-6] that are also environmentally friendly.[7] Moreover, the possibility to assembly such 2D crystals in vertical heterostructures will provide a rich toolset for the creation of new materials,[1,2,8] enabling the realisation of next-generation devices.

However, one of the key requirement for applications such as flexible (opto)electronics and energy storage and conversion is the development of industrially scalable production processes,[2,8] which provides a balance between ease of fabrication and final material quality with on-demand tuneable properties.

Liquid-phase exfoliation[2,8,9] is offering a simple and cost-effective pathway to fabricate various 2D crystal-based (opto)electronic and energy devices, presenting huge integration flexibility compared to conventional methods. Here, I will show our scaling up approach for the solution processing of graphene and other 2D crystal based on wet-jet milling of layered materials. Moreover, I will present an overview of graphene and other 2D crystals for flexible and printed (opto)electronic[11] and energy[12-15] applications, throughout the fabrication of large area electrodes[12] to devices integration.[10-15]

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