Solution processing of graphene and other 2d crystals for energy conversion and storage

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Technological progress is driven by developments in material science. Breakthroughs can happen when a new type of material or new combinations of known materials with different dimensionality and functionality are created. Graphene, because of its many superior materials properties, has the opportunity to enable new products.[1] Graphene is just the first of a new class of two dimensional (2d) crystals, derived from layered bulk crystals.[2] The assembly of such 2d crystals (heterostructures) will provide a rich toolset for the creation of new, customised materials.[1,2]

New materials and processes[1] can improve the performance of existing devices or enable new ones[2,3,4,5] that are also environmentally benign. In this context, graphene and other 2d crystals are emerging as promising materials.[1-5] A key requirement for applications such as flexible electronics and energy storage and conversion is the development of industrial-scale, reliable, inexpensive production processes,[2] while providing a balance between ease of fabrication and final material quality with on-demand properties.

Solution-processing[2] offers a simple and cost-effective pathway to fabricate various 2d crystal-based flexible and energy devices, presenting huge integration flexibility compared to conventional methods. Here I will present an overview of graphene and other 2d for flexible and printed (opto)electronic and energy applications, starting from solution processing of the raw bulk materials,[2] the fabrication of large area electrodes[3] and their integration in the final devices.[6,7,8,9]

References

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