

Exfoliation of Layered Conductive Materials in Solutions

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Abstract

Layered materials are important resources for graphene and other conductive or semiconducting two-dimensional (2D) materials, which have led to widespread enthusiasm both in academia and industry. Despite the advantages of these exciting materials have been illustrated everywhere, they have not yet found their ways into everyday life products. The major challenge is the reproducible bulk production of high-quality 2D flakes at low cost. Recent discovery reveals that when the layered counterparts are used as working electrodes in an electrochemical cell, an electric current drives the migration of ions or charged molecules into the interlayers and pushes thin layers apart [1-4]. Relying on the rational design of electrolytes and strategies, electrochemical exfoliation can be particularly facile yet efficient with many other advantages such as upscalability, solution processability and eco-friendliness. This talk will focus on our recent progress on the scalable exfoliation of layered conductive materials into high-quality, solution-processable 2D flakes (Figure 1). Some examples for the application of our exfoliated materials will also be presented (Figure 2).

References

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[4] S. Yang, S. Brüller, Z. S. Wu, Z. Liu, K. Parvez, R. Dong, F. Richard, P. Samori, X. Feng, K. Müllen, *J. Am. Chem. Soc.*, 137 (2015) 13927.

Figures

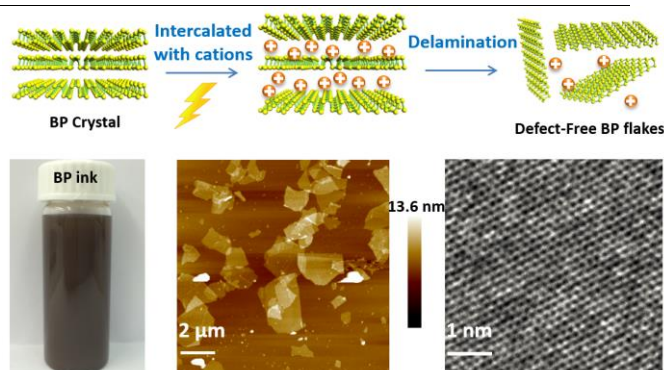


Figure 1: Exfoliation of bulk black phosphorus into defect-free, high-mobility flakes

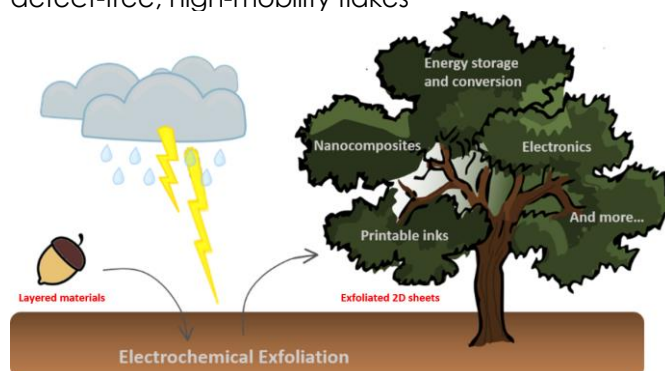


Figure 2: Electrochemical exfoliation of layered conductive materials for a wide spectrum of applications