

Electrochemical Exfoliation of Black Phosphorus

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Black phosphorus (BP) has recently attracted great attention due to its tunable, layer-dependent bandgap, high carrier mobility, good current on/off ratio, as well as unique in-plane anisotropy, which renders the material attractive for nanoelectronic, thermoelectric and photonic devices.^[1]

The major challenge for a successful application lies in the fabrication of few- or single layer nanosheets of BP. Several methods have been developed, while mechanical and liquid exfoliation of the bulk crystals figure amongst the most prominent ones.^[2] However, large-scale exfoliation leading to uniform and stable dispersions in high yield remains a challenge. At this point, electrochemical driven exfoliation, which has been successfully employed for graphene and other 2D materials, yielding nanosheets in good quality and high yield, emerged as an attractive alternative.

Herein, we focus on the electrochemical exfoliation of BP. We present a screening of different electrolytes, reaction conditions, solvents and ionic liquids,^[3] and their effects on both, the exfoliation process itself and on the quality of the obtained BP nanosheets.

References

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