
Exfoliation Mechanism of 2D-Boron Nanosheets

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Abstract

Boron in its bulk 3D-crystal form is not inherently a layered material that can be easily exfoliated into a 2D material like graphene. However, it has been reported that 2D sheets, or even a single atomic layer of boron, known as borophene, can be experimentally exfoliated from bulk boron crystals. In this study, we propose a mechanism to explain this intriguing phenomenon. Through extensive characterization of the starting bulk boron material and the resulting boron 2D sheets using XRD, Raman spectroscopy, AFM, and STEM, we conclude that exfoliation occurs along planar defects in the bulk material [1]. This hypothesis is further supported by materials simulation calculations. Our findings could potentially explain the exfoliation of other non-layered materials and pave the way for engineering the production of 2D materials from non-layered 3D materials.

References

- [1] Jing-Yang Chung, Yanwen Yuan, Tara P. Mishra, Chithralekha Joseph, Pieremanuele Canepa, Pranay Ranjan, El Hadi S. Sadki, Silviya Gradečak, Slaven Garaj, Nature Communications, 15 (2024) 6122
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