Electronic Supporting Information

Exfoliation of boron carbide into ultrathin nanosheets

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1. Computationally Relaxed Structures

The images in this section show computationally relaxed structures of B₄C cleaved along different planes but terminated at different heights. The surfaces have been allowed to relax, and different rearrangements or reconstructions of the atoms are seen. In all these images, the boron atoms are green while the carbon atoms are red.

1.1. (001) plane

Figure S1: Relaxed structures for different terminations for cleavage along the (001) plane.
1.2. (101) plane

Figure S2: Relaxed structures for different terminations for cleavage along the (101) plane.
1.3. (012) plane

Figure S3: Relaxed structures for different terminations for cleavage along the (012) plane.
2. Additional Raman spectra

![Optical microscope image of two B₄C nanosheets](image1.png)

**Figure S4.** Example of B₄C flakes with different intensity ratios between the 481 and 533 cm⁻¹ peaks. (a) Optical microscope image of two B₄C nanosheets produced by tip sonication in IPA for 2 hours, and then spin coated three times at 3,000 rpm on a sapphire substrate, and then annealed at 500°C for 5 h. (b) Raman spectra of flakes A and B labeled in panel (a), compared to the spectrum of bulk B₄C powder. Flake A shows no carbon peaks (in the range ~1300 to ~1600 cm⁻¹), and the intensity ratio (I₄₈₁ / I₅₃₃) is close to 1. Flake B shows prominent carbon peaks and the I₄₈₁ / I₅₃₃ ratio is close to 2. Other characteristic B₄C peaks are seen in both Flakes A and B. The I₄₈₁ / I₅₃₃ ratio is also close to 2 in the bulk B₄C powder.
Figure S5. Each trace shows the change in the ratio of the area of the D band at 1350 cm\(^{-1}\) and the area of the B\(_4\)C peak at 1080 cm\(^{-1}\) for an individual B\(_4\)C nanosheet as a function of laser irradiation time. Panels (a)-(d) show the four types of time evolution as described in the main text. There are 50 total B\(_4\)C nanosheets shown.
3. Stability of $\text{B}_4\text{C}$ nanosheets

Figure S6. Comparison of Raman spectra for LPE-produced $\text{B}_4\text{C}$ flakes under different conditions/environments. The main peaks from $\text{B}_4\text{C}$ are labelled with numbers indicating their wavenumber positions and are also indicated by the vertical dashed lines. The boric acid peaks are marked with *. 