

Supporting Information for

Electrochemically Integrated 2D Borophene–Graphene Architectures for Energy and Antimicrobial Applications

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Table S1: Ultrasonic duration and amount of boron (mg) in graphite.

Duration (min)	Average weight of boron in graphite (mg)
15	0.1
30	0.2
60	0.5
120	1.0
180	1.5

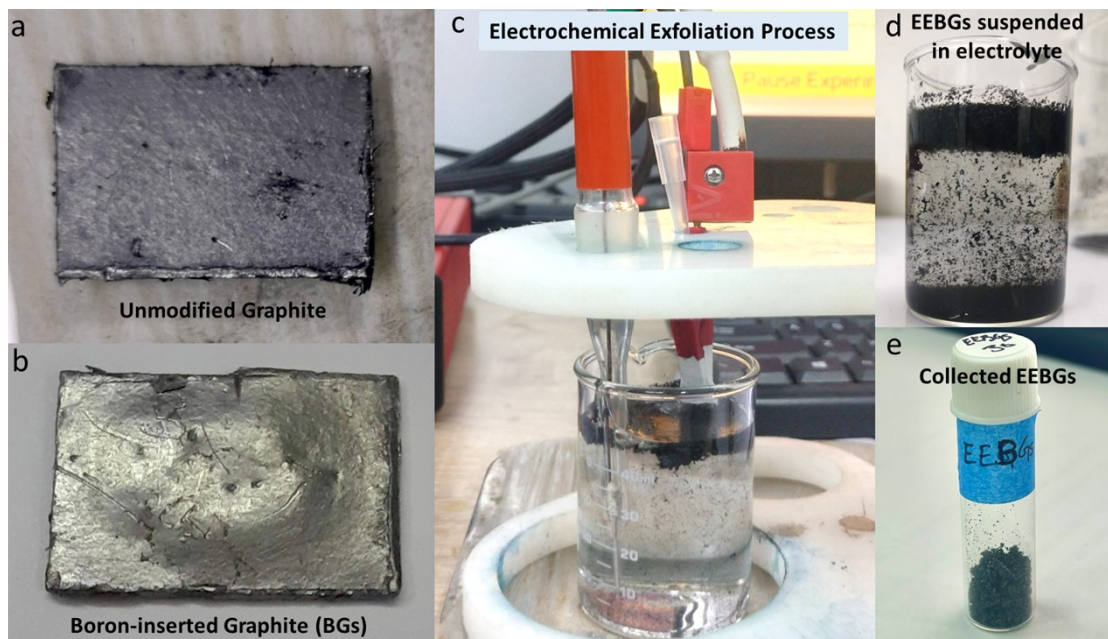


Figure S1. (a) Unmodified graphite foil before boron insertion, (b) silvery grey colored graphite foil after boron insertion (30 min ultrasonication) (BGs), (c) electrochemical exfoliation process, (d) EEBGs suspended in the electrolyte after exfoliation process, and (e) EEBGs collected after exfoliation, cleaning, and drying.

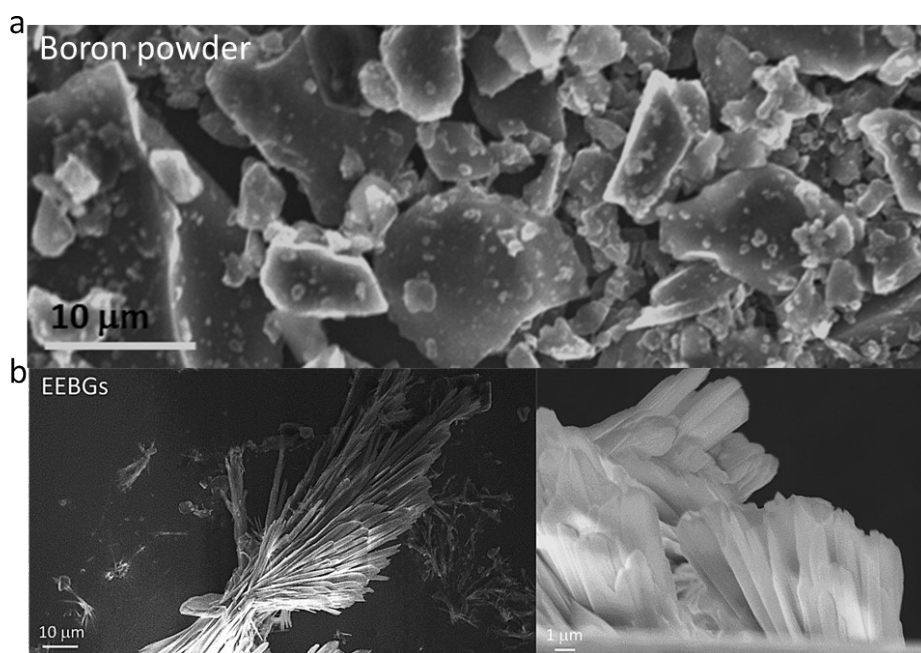


Figure S2. (a) SEM images of boron powder deposited after ultrasonication in water on a Si wafer, (b) SEM images of EEBGs taken from different angles showing the fine sheet-shaped structure of the material.

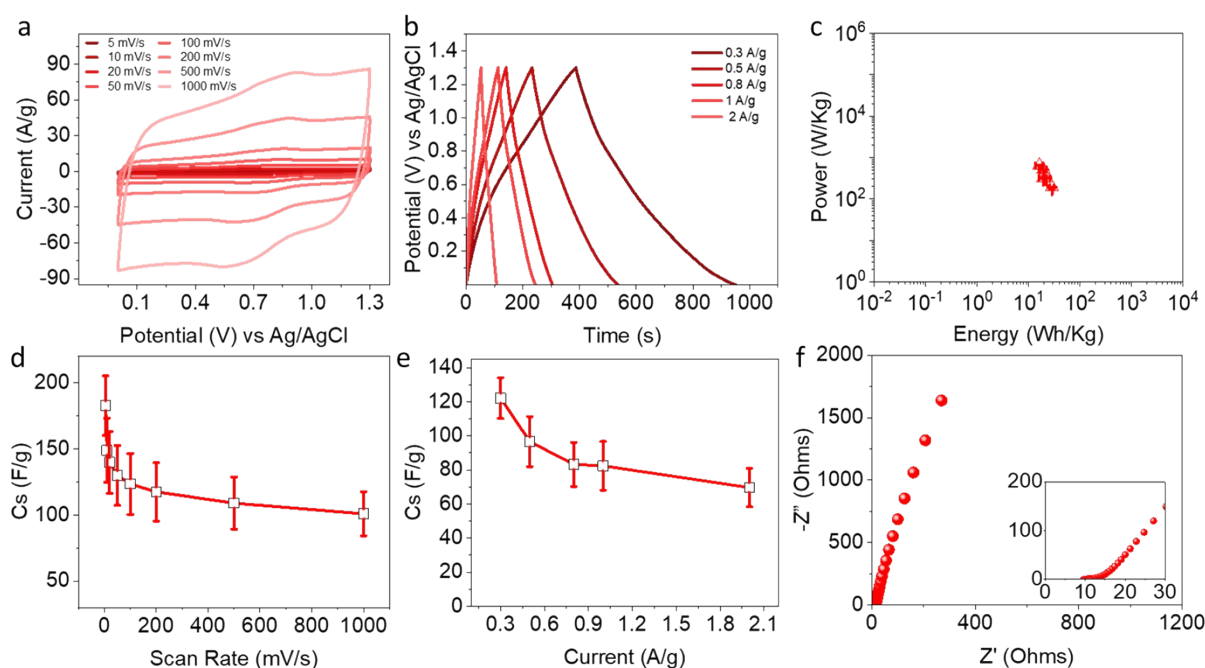


Figure S3. Supercapacitor performance of EEBGs in 0.5 M H₂SO₄ using a three-electrode electrochemical setup (a) CV plots at several scan rates. (b) GCD plots. (c) Ragone plot of Power density vs Energy density. (d) Specific capacitance as a function of scan rates. (e) Specific capacitance as a function of current density. (f) Nyquist plots.

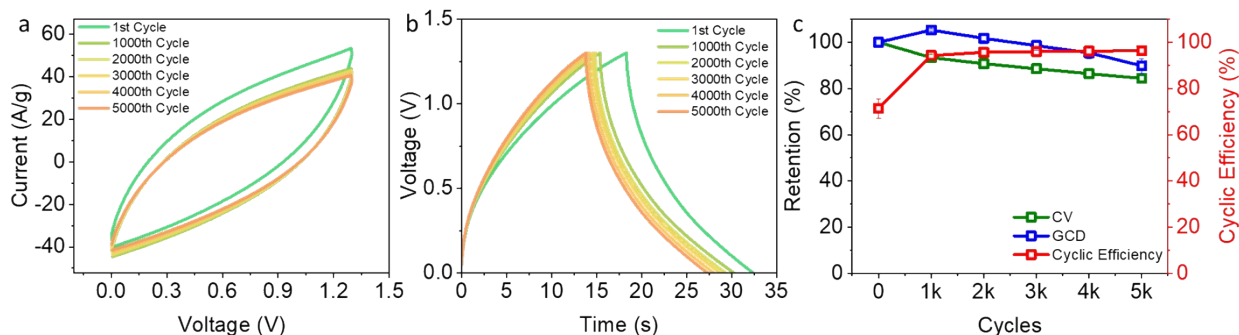


Figure S3. 5000 potential cycles stability test (a) CV, (b) GCD, and (c) Retention percentage and cyclic efficiency for EEBGs based supercapacitor device.

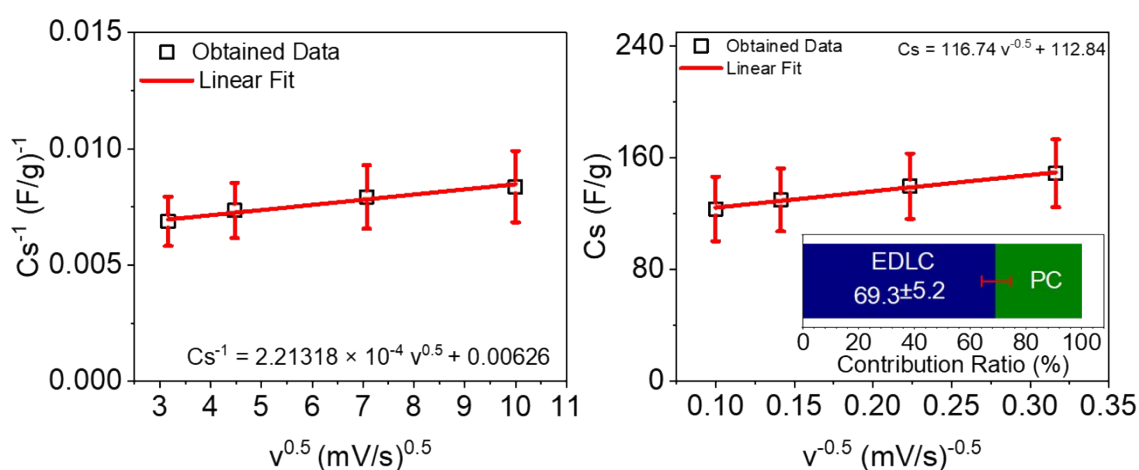


Figure S4. Trasatti's analysis to separate the capacitive charge storage originating from the electrochemically accessible outer surface and the diffusion-limited inner surface. (a) Inverse of specific capacitance as a function of the square root of scan rate (b) Specific capacitance as a function of the inverse of the square root of scan rate.

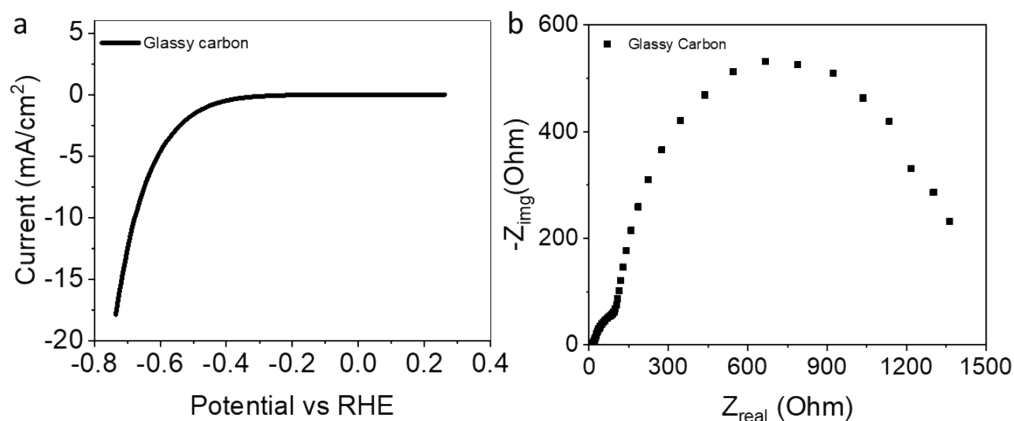


Figure S5. Electrochemical HER performance of glassy carbon electrodes in 0.5 M H_2SO_4 . (a) LSV and (b) Nyquist plot

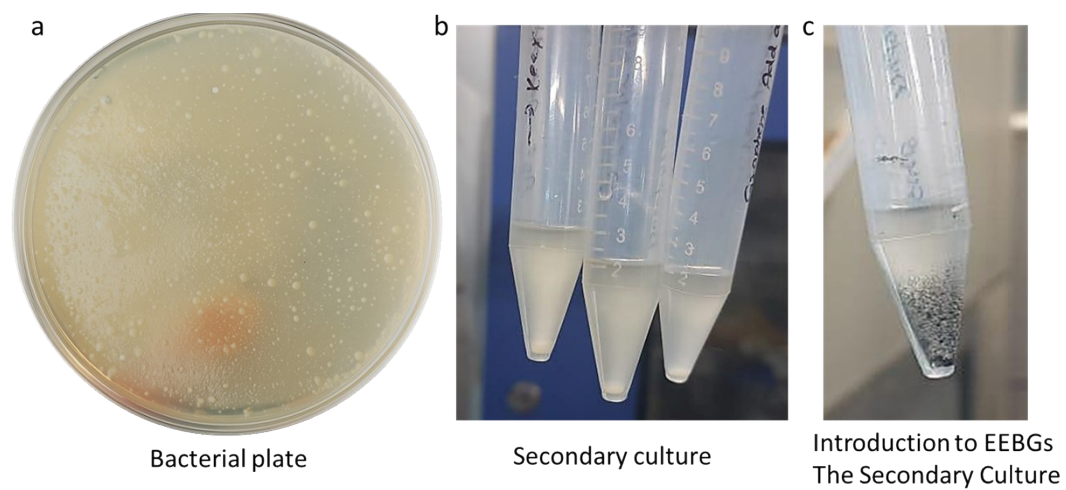


Figure S6. (a) A bacterial plate prepared using a household kitchen waste, (b) secondary culture prepared using bacteria+LB broth, and (c) introduction of EEBGs into secondary culture.