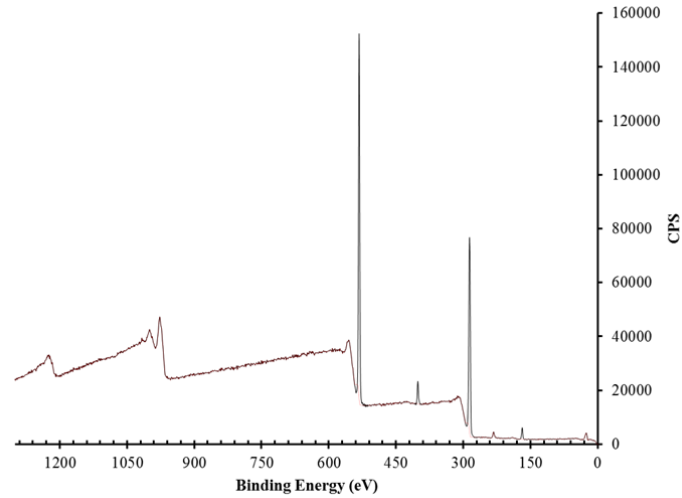


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15 **Supplementary Figure 1. Low magnification images of the graphene network** in the directions (a)
16 perpendicular and (b) parallel to the ice growth. The insert in (a) shows pictures of the foams before
17 (bottom) and after (top) thermal reduction. Scale bars, 500 μm (a), 100 μm (b).

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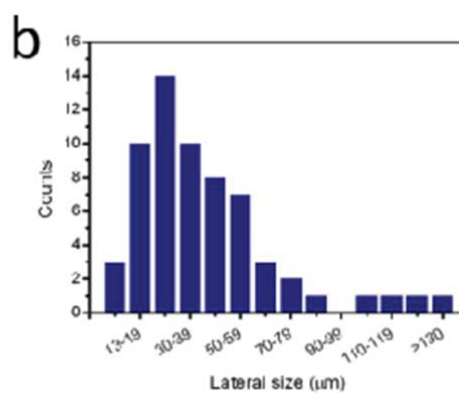
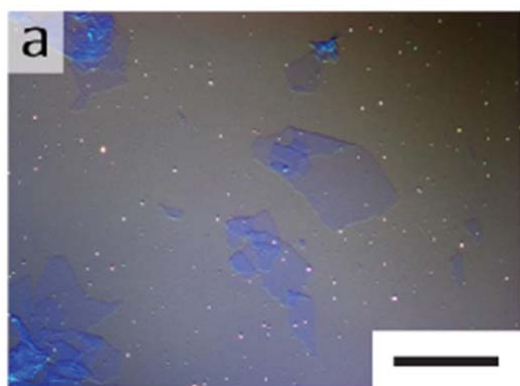


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20 **Supplementary Figure 2. XPS survey of freeze dried CMG.** Atomic composition C1s (53.5%),
21 N1s (3.5%), O1s(38.8%), S2p (4.2%). Sulphur and Nitrogen are attributed to the vacuum grease used
22 during the freeze casting process while the small fraction of Sulphur can be a residue from the
23 synthesis route.

24

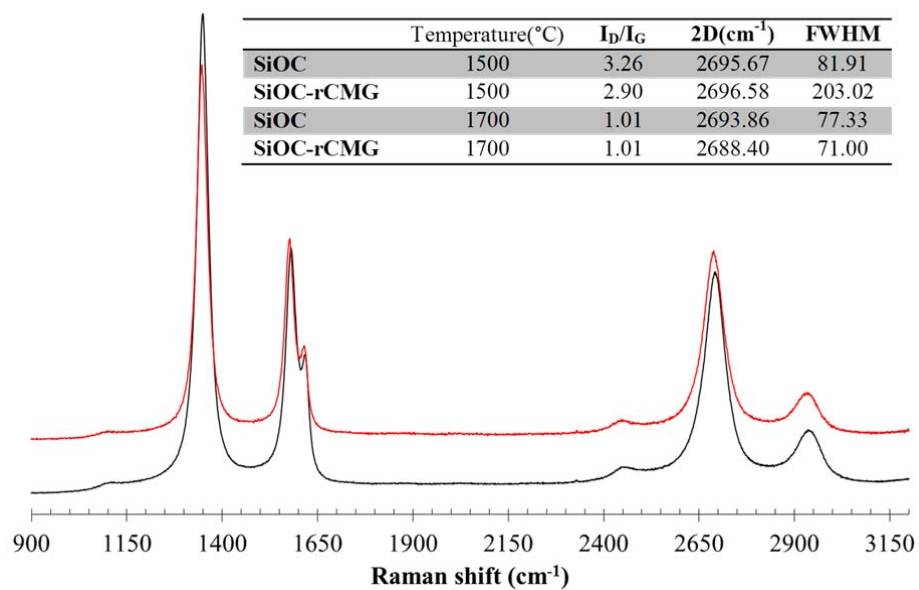
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26

27 **Supplementary Figure 3. CMG flake size analysis.** (a) Optical microscope image of CMG flakes on
28 Si/SiO₂ substrate obtained by differential interference contrast. (b) Lateral size distribution for 100
29 CMG flakes. Scale bar, 50 μm (a).

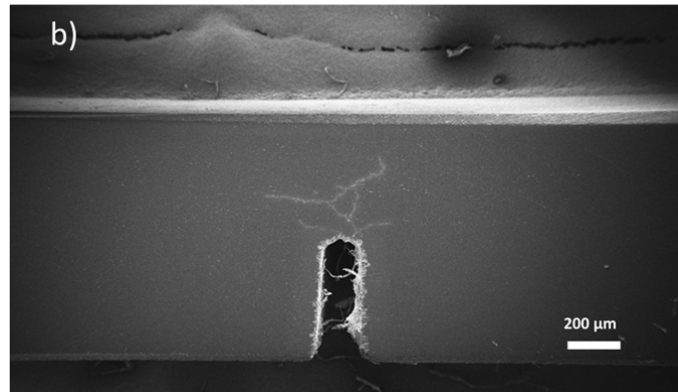
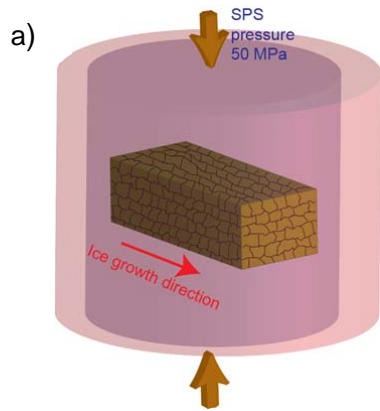
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32 **Supplementary Figure 4. Raman study of SiOC-rCMG composites.** Raman spectra of pure matrix
 33 SiOC (black) and composite (red) at 1700 °C. Inset table. Calculated Raman parameters at 1500 °C
 34 and 1700 °C.

35



36

37 **Supplementary Figure 5. Spark Plasma Sintering layout and SENB dead-specimen micrograph.**

38 (a) Schematic illustration of the infused foams into the SPS graphite die and (b) notched sample
39 micrograph after R-curve testing

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