

Supplementary Information

for

**Ultrahigh-temperature conversion of biomass to highly
conductive graphitic carbon**

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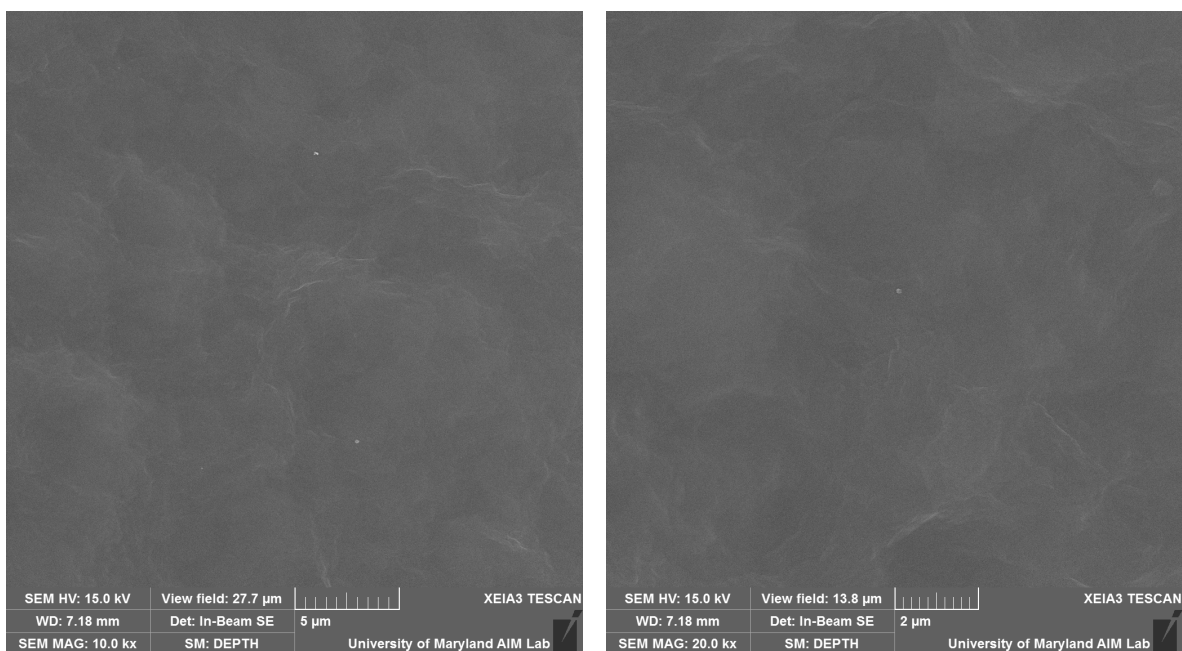


Figure S1 SEM image of the surface of GO-Lignin film

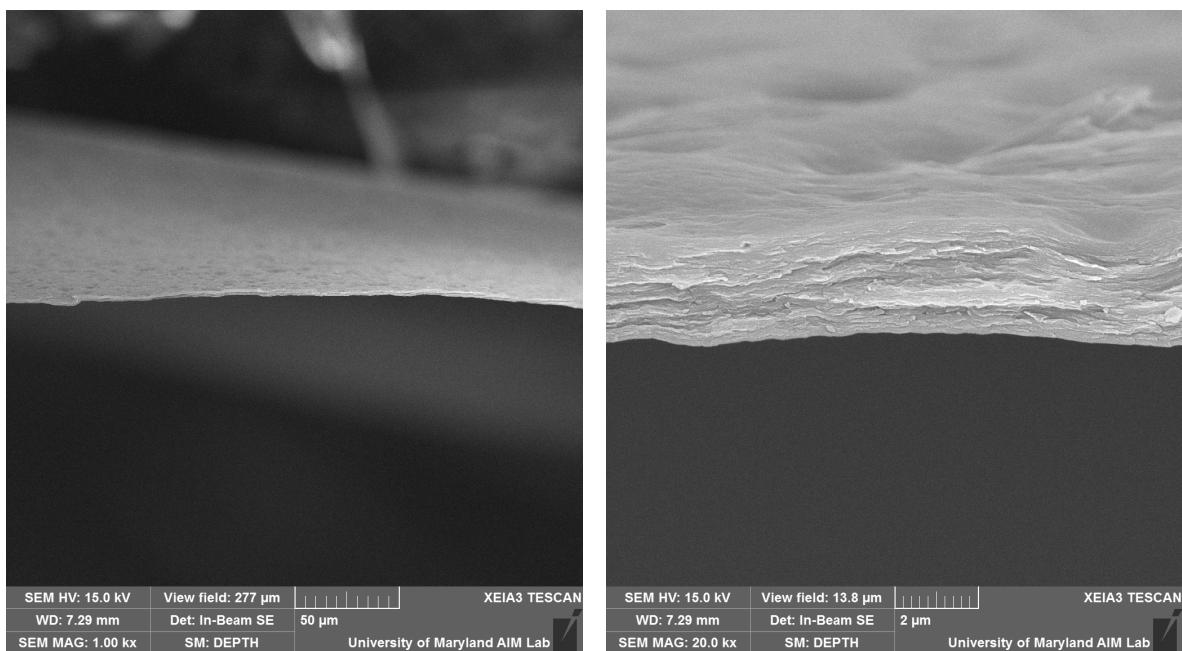


Figure S2. SEM image of the cross section of GO-Lignin film

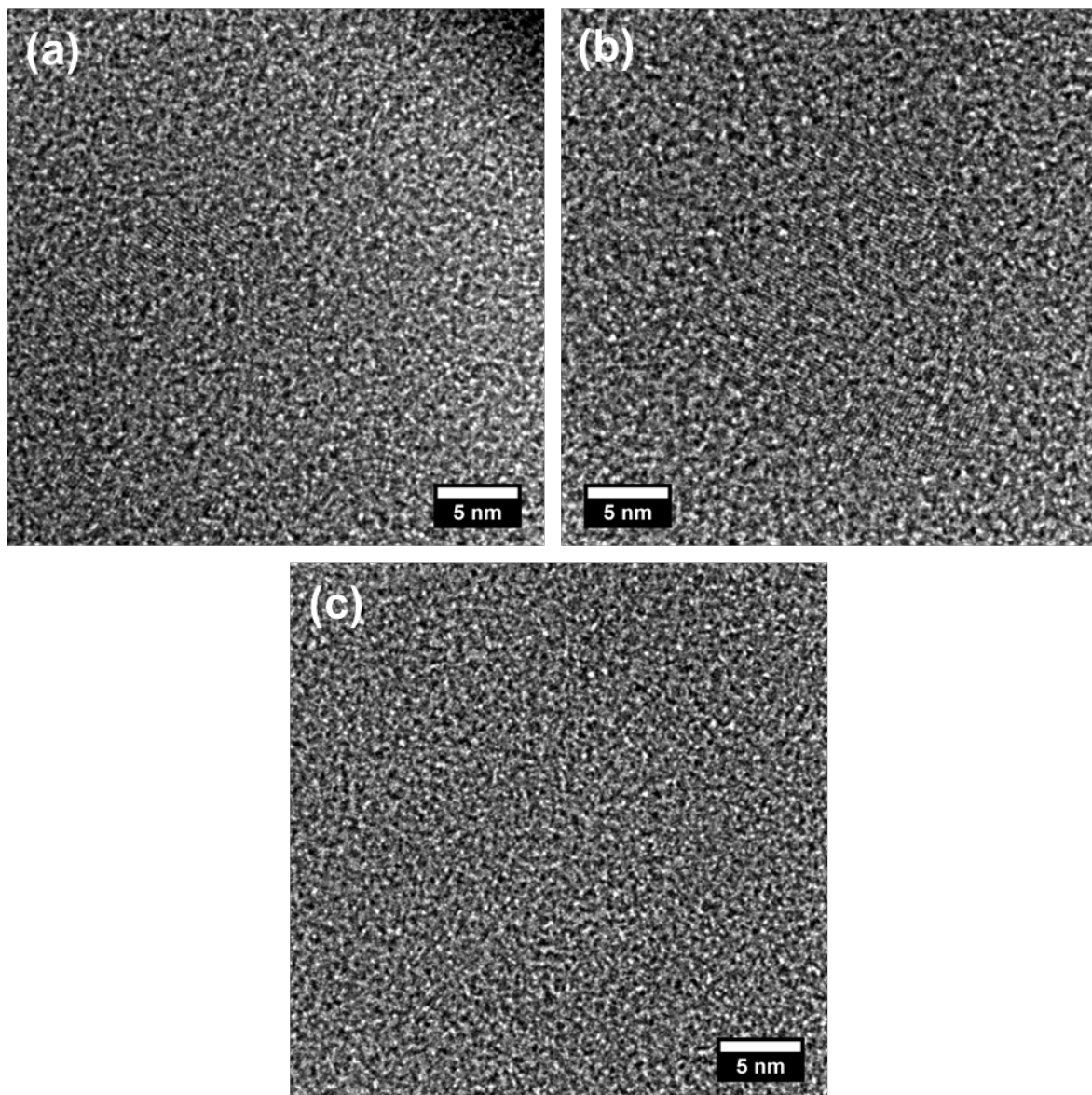


Figure S3. HRTEM images of the rGO-lignin carbon film before Joule heating, showing a mixture of crystalline and amorphous domains.

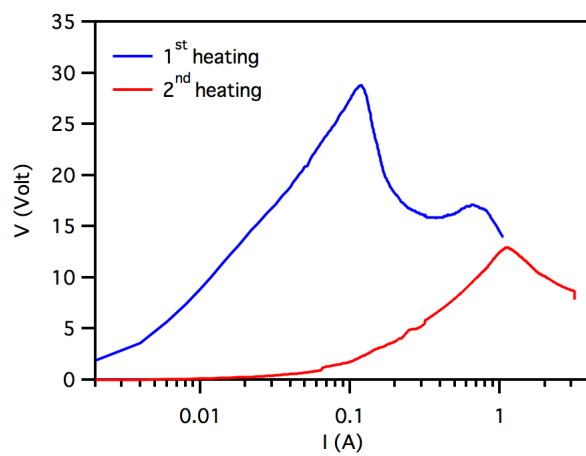


Figure S4. Heating steps in the Joule heating process with two separate heating, the current ramps from 0 to 1 A during 1st heating step., and from 0 to 3.15 A during 2nd heating step.

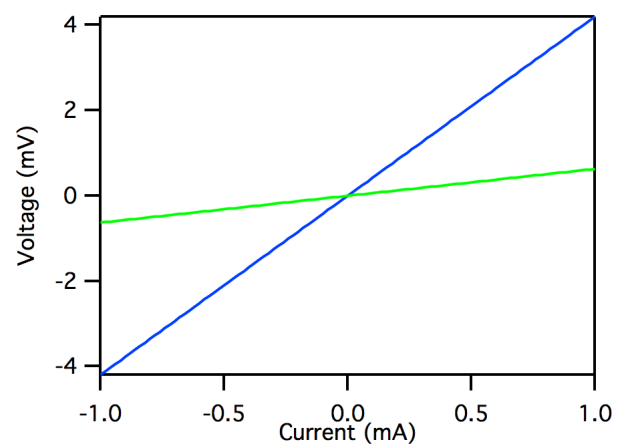


Figure S5. I-V curves for the rGO-Lignin annealed at 1840 (blue) and 2465 K (green) in Figure 3c.

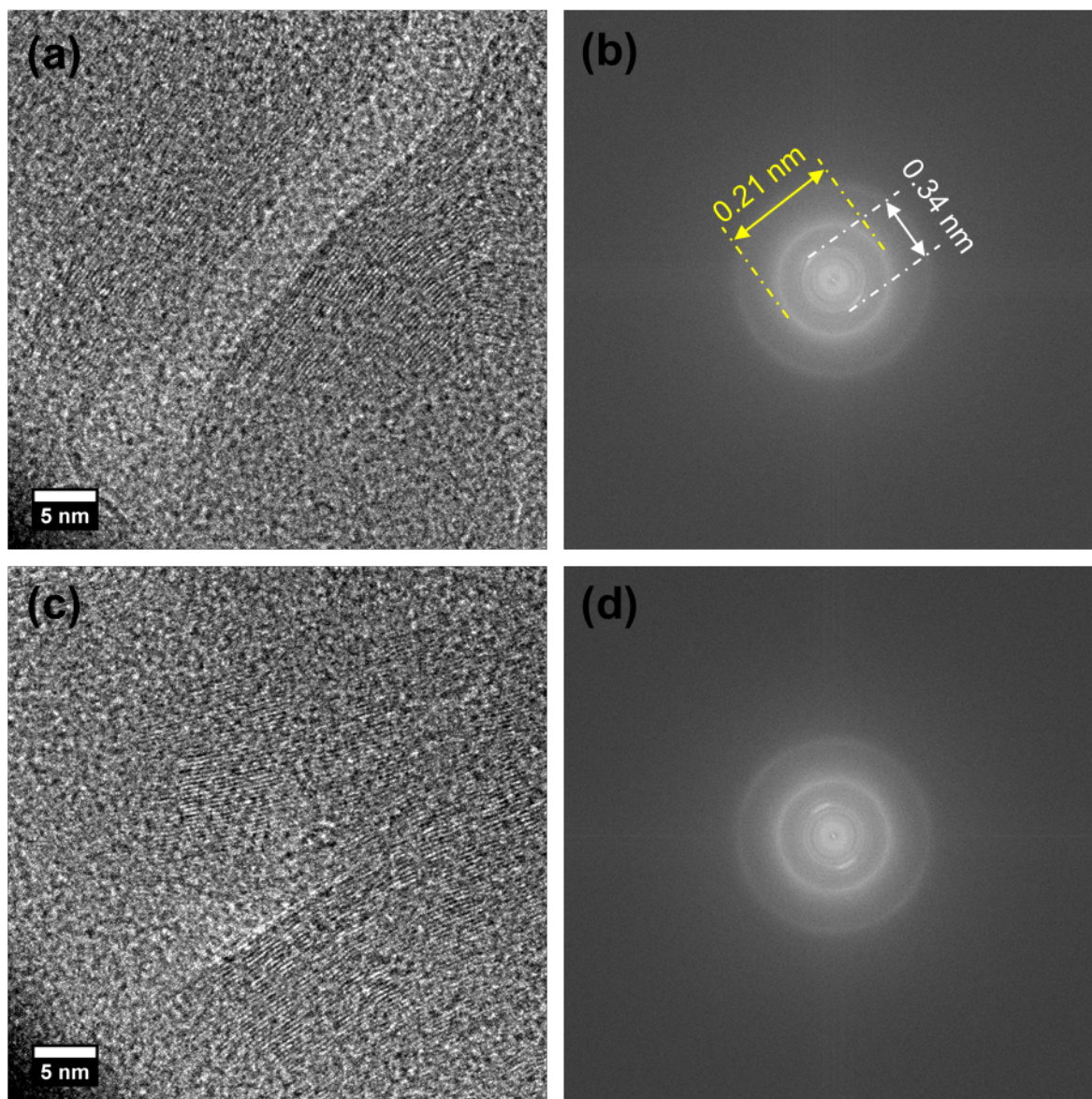


Figure S6. (a,c) HRTEM images and (b,d) corresponding FFT patterns from the Joule heated rGO-lignin carbon films showing graphitic carbon with an interlayer spacing of $0.34 \pm .02$ nm and short range ordered carbon with nearest neighbor distances of 0.21 ± 0.02 nm.

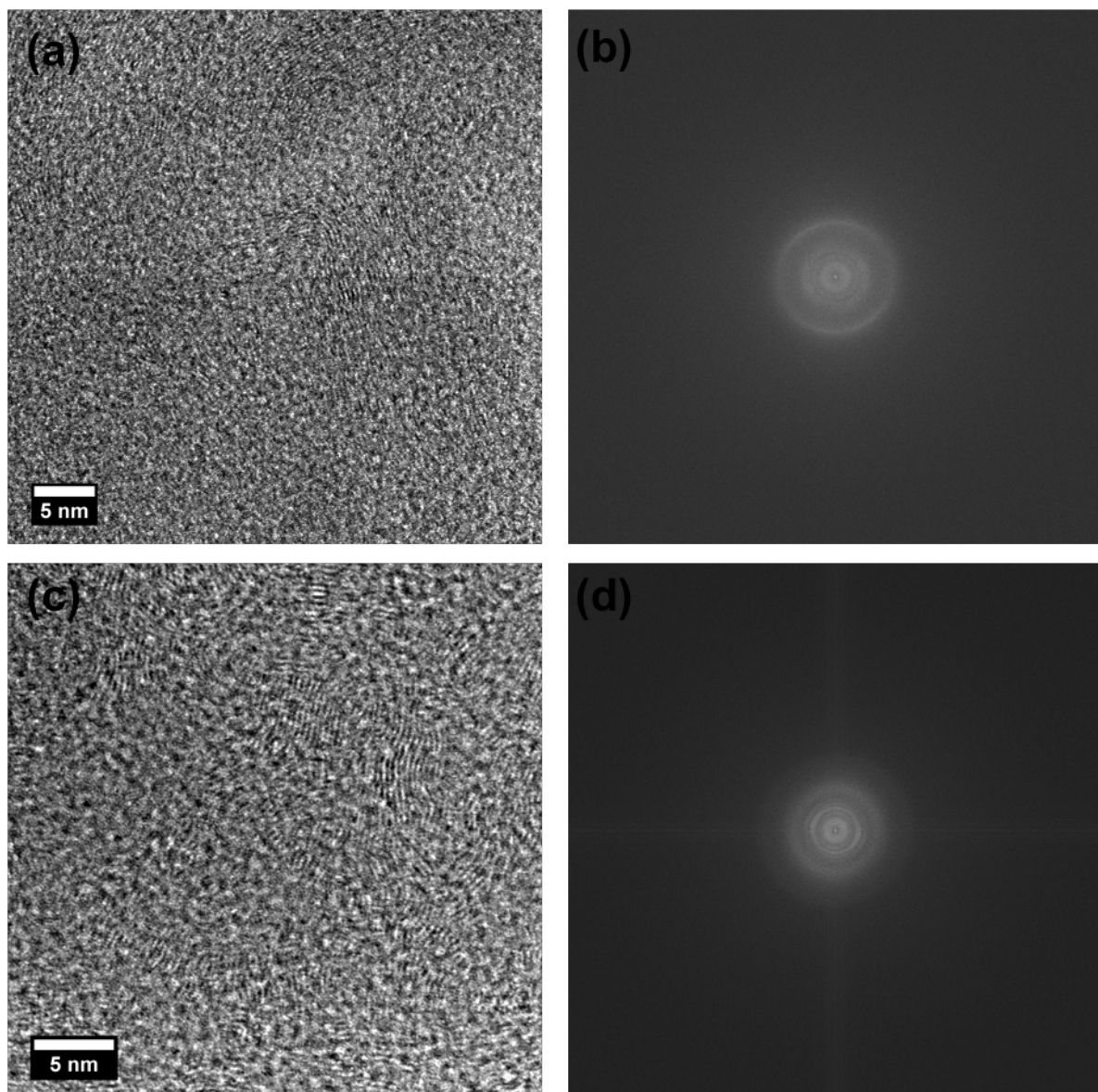


Figure S7. (a,c) HRTEM images and (b,d) corresponding FFT patterns from the Joule heated rGO-lignin films showing short range ordered carbon with an interlayer spacing of $0.34 \pm .02$ nm (inner ring in FFT) and nearest neighbor distances of 0.21 ± 0.02 nm (outer ring in FFT).