Electronic Supplementary Material (ESI) for Nanoscale.

Formation of 3D Graphene Foams on Soft Templated Monoliths

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Supporting Information

S1. Raman Data of CuGF

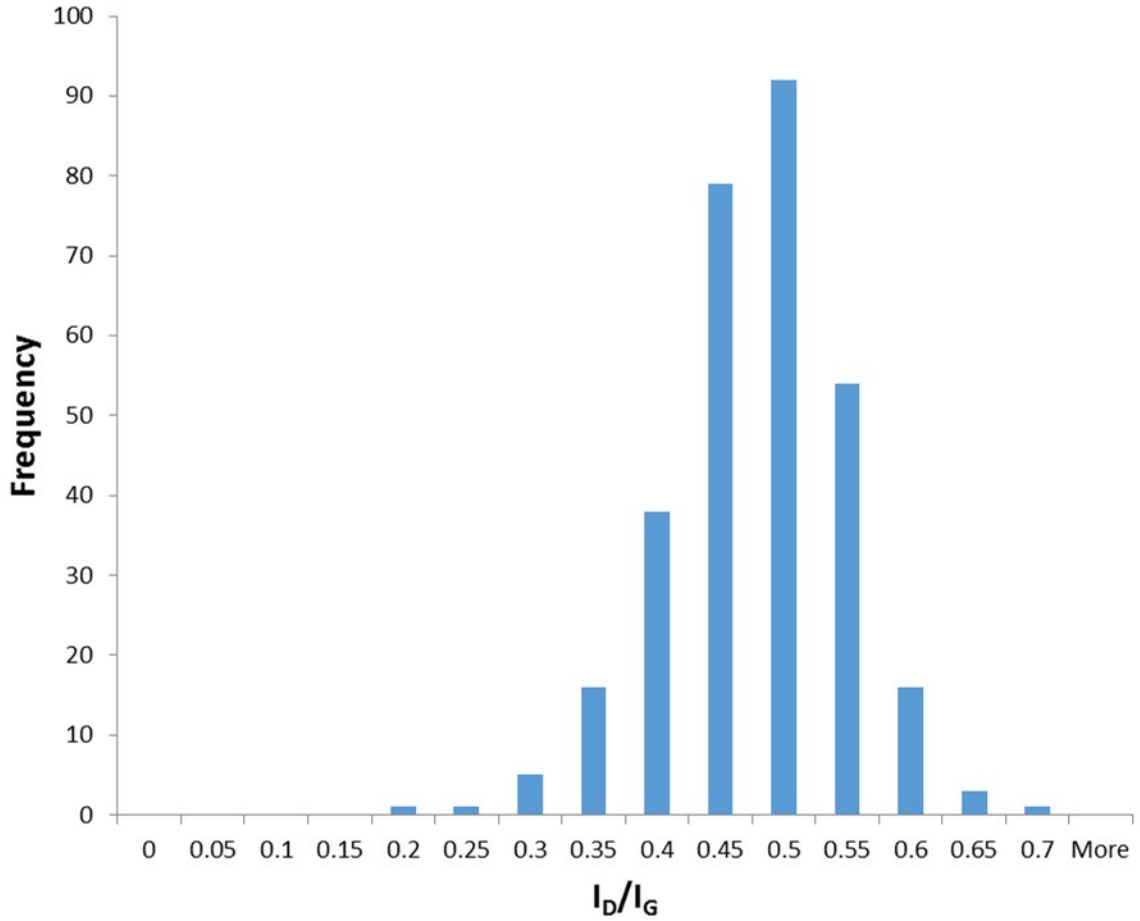

Figure S1: Histogram of the I_D/I_G ratio for CuGF (307 spectra). From the equation $L_a(nm) = (2.4 \times 10^{-10})\lambda^4(I_D/I_G)^{-1}$, where L_a is average crystallite size and λ is laser excitation wavelength the average crystallite size of the graphene on the copper foam was found to be 42.5 nm (SD = 8.4)

S2. EDX Data

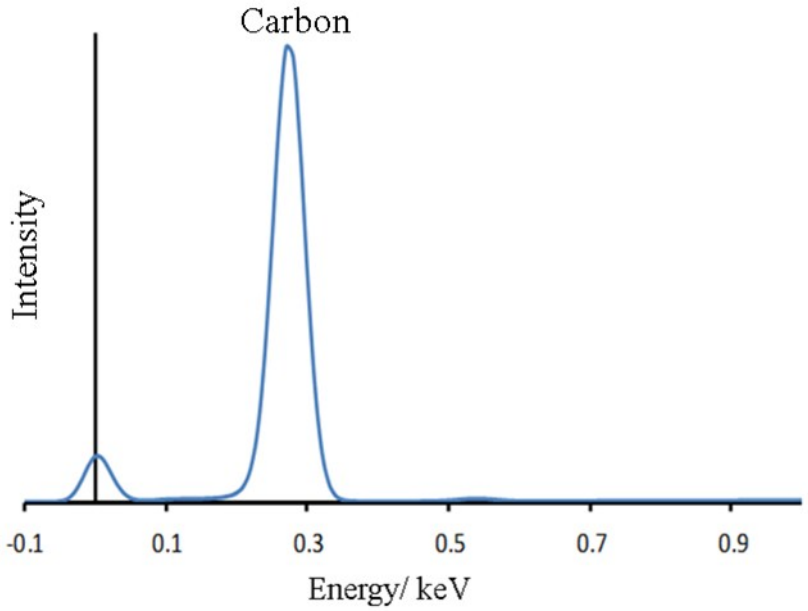

Figure S3:EDX spectra taken from figure 6(A) at 15 kV showing only the presence of carbon and no cobalt.

S3. Powder x-ray Diffraction (PXRD)

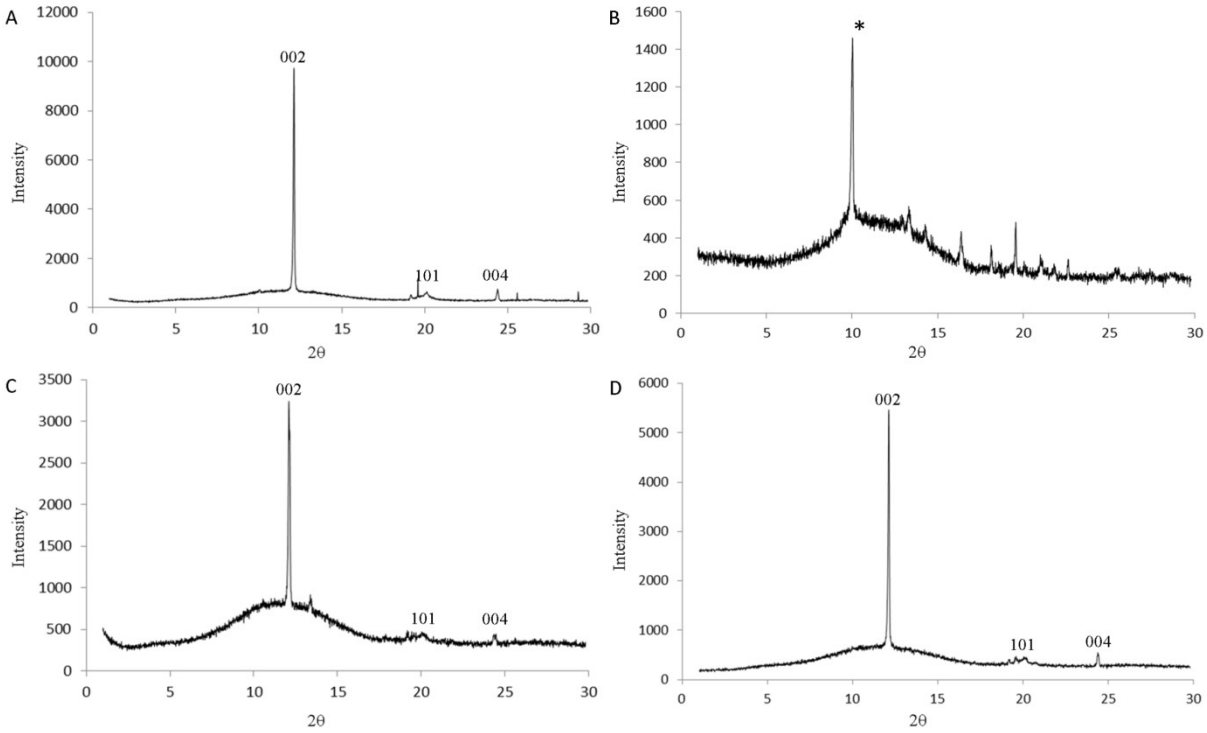

Figure S5: PXRD patterns of (A) iron graphene foam, (B) copper graphene foam, (C) nickel graphene foam and (D) cobalt graphene foam; showing the characteristic peaks for graphitic carbon of (002), (101) and (004). Mo Kα1,2 X-ray source, λ = 0.7093 Å.

*peak due to cristobalite (a polymorph of quartz) contaminant from the furnace work tube. No carbon peaks were observed in the PXRD from the copper graphene foam, presumably due to its poor crystallinity.

S4. Thermogravimetric Analysis (TGA)

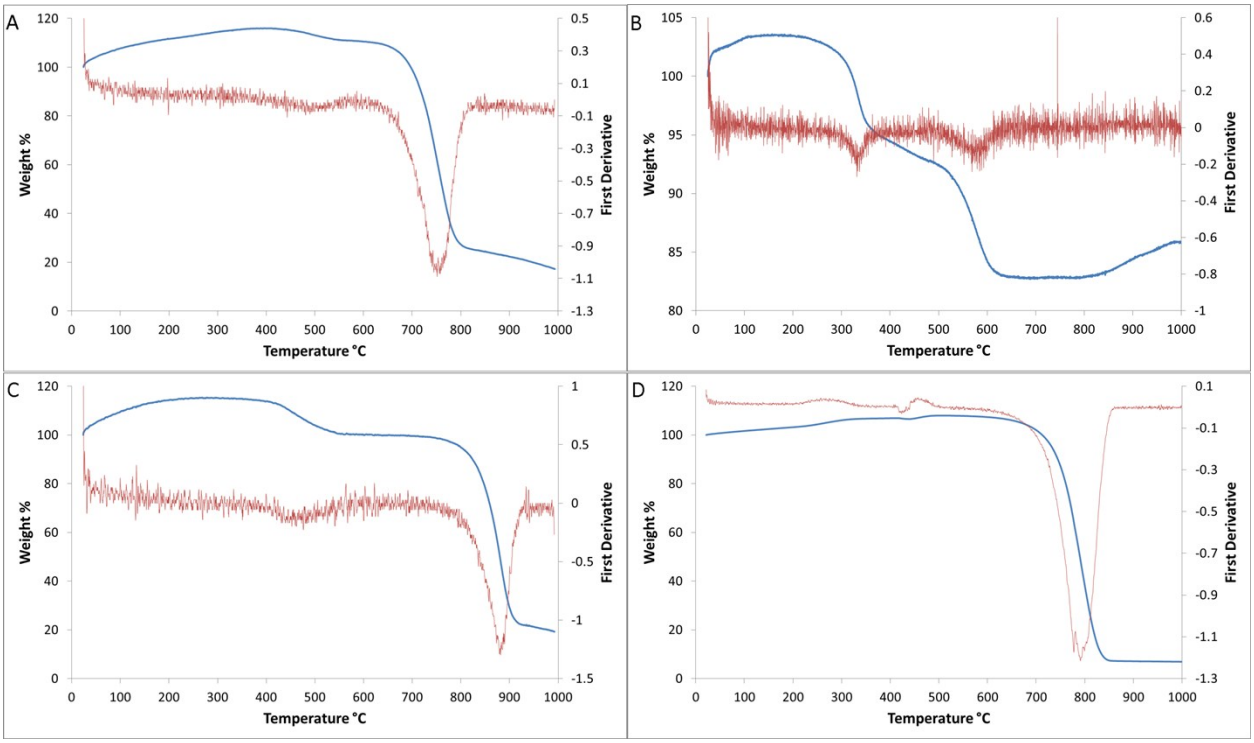

Figure S6: TGA (blue) and first derivative plots (red), recorded in air from ambient to 1000 ^{o}C at 10 ^{o}C min^{-1}, of (A) iron graphene foam, (B) copper graphene foam, (C) nickel graphene foam and (D) cobalt graphene foam showing onsets at 675 °C, 303 °C, 816 °C and 715 °C respectively. The copper graphene foam shows a considerably lower onset burn temperature due to the poor graphitic nature of the carbon. The remaining mass in the samples is attributed to the metal oxide from the template used. The derivative TGA curves have been smoothed according to adjacent-averaging.

S5. Additional SEM Images

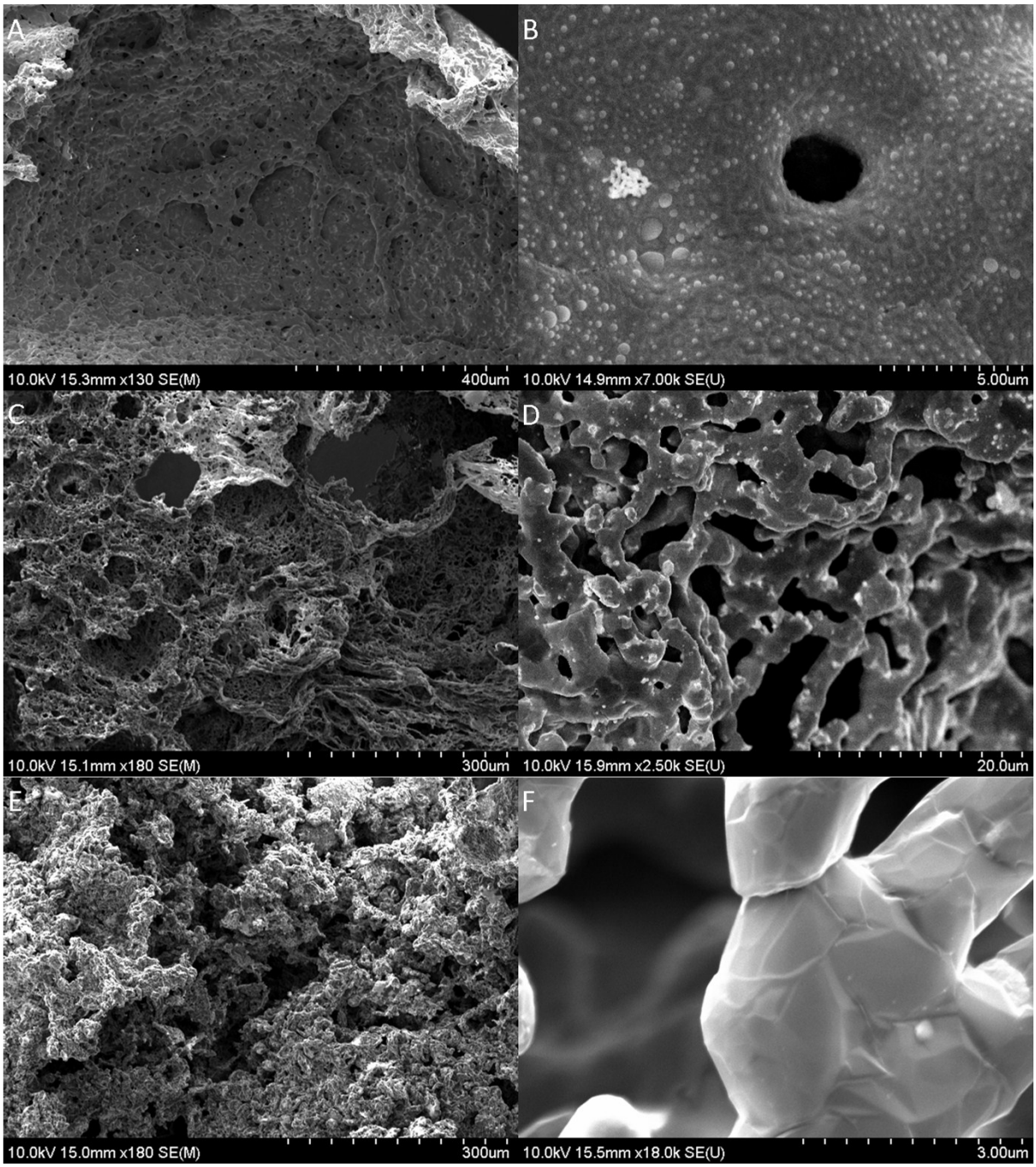

Figure S7: SEM (SE) images of copper graphene foam (A) and (B), nickel graphene foam (C) and (D), and iron graphene foam (E) and (F).

S6. Conductivity and Thickness Measurement.

Sheet resistance of filter cakes of the graphene material from the cobalt graphene foam were measured using the four-point-probe method and were found to be between 500 – 600 Ω sq^{-1} across several samples for an ~ 120 µm thick films, shown in figure S4. This is comparable to other synthetic graphene material.[1] It is important to note that TGA data suggests that under 7% residual cobalt oxide remains in the material after the TGA of the acid washed and may contribute to conductivity. Multimeter readings were taken of the metal/graphene foam and gave values of 0.3 Ω, 0.6 Ω, 0.8 Ω, 0.3 Ω and 0.8 Ω for the CuGF, CoGF, FeGF, NiGF and the CoGF post acid wash respectively.

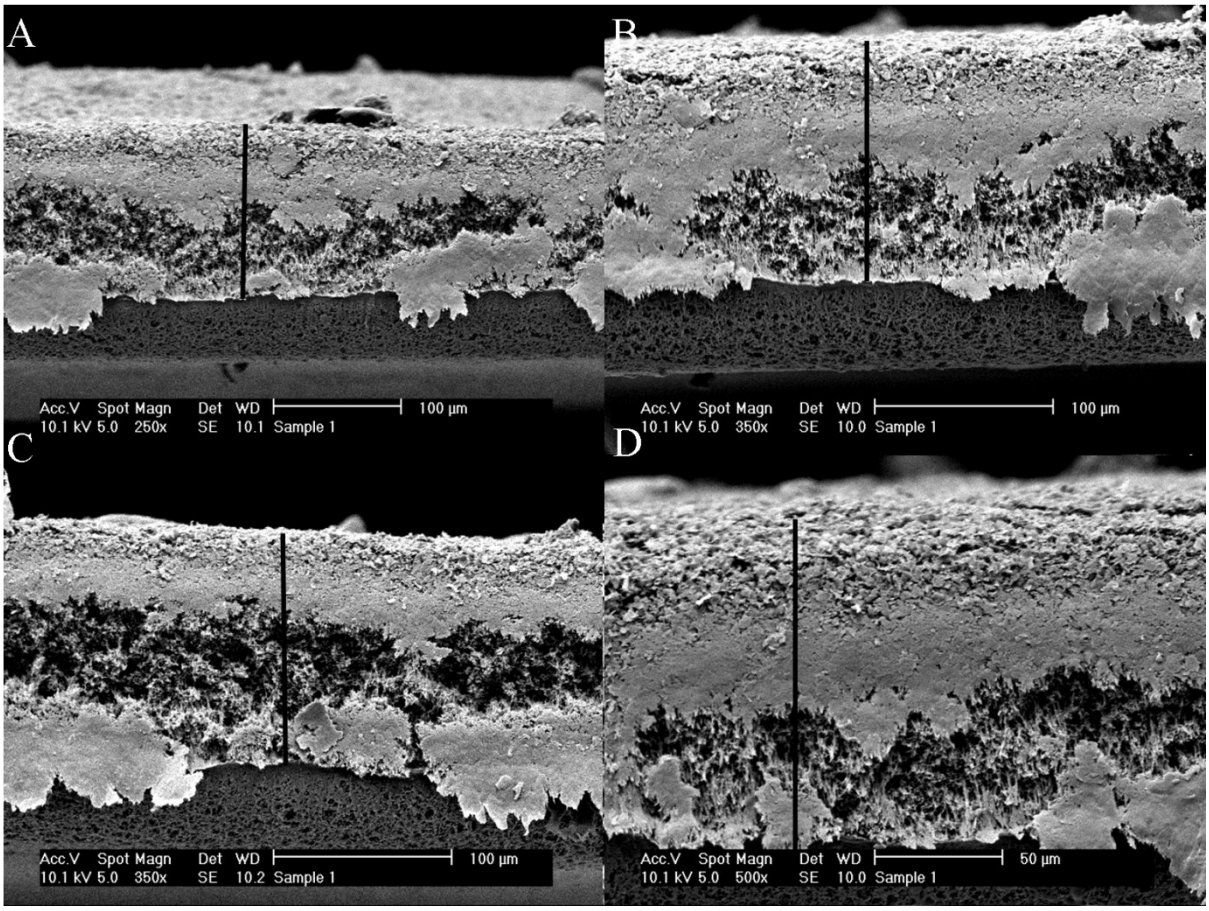

Figure S8: SEM (SE) images of a graphene thin film cast down onto a polycarbonate membrane. Film thickness is shown to be 119 µm (A), 125 µm (B), 118 µm (C), and 120 µm (D).

1. J.-S. Lee, H.-J. Ahn, J.-C. Yoon and J.-H. Jang, *Phys. Chem. Chem. Phys*., 2012, **14**, 7938–43