[Electronic Supplementary Information]

Facile Fabrication of Highly Flexible Graphene Paper for High-Performance Flexible Lithium Ion Battery Anode

Mokwon Kim,[1] DoYoub Kim,[2] Yongku Kang,[2] O Ok Park*[1]

[1]Department of Chemical and Biomolecular Engineering (BK21+ graduate program), Korea Advanced Institute of Science and Technology (KAIST), 291 Deahak-ro, Yuseong-gu, Daejeon 305-701, Republic of Korea.

[2]Advanced Materials Division, Korea Research Institute of Chemical Technology (KRICT), 141 Gajeong-ro, Yuseong-gu, Daejeon 305-600, Republic of Korea.

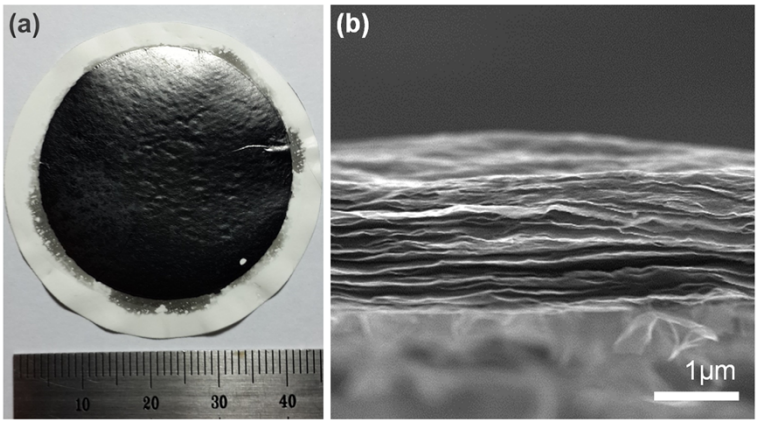

Fig. S1 a) Optical and b) SEM images of reduced graphene oxide (rGO) paper with the same amount of graphene derivatives for the GNP/GO paper. The rGO paper was fabricated by a vacuum filtration using GO dispersion after chemical reduction by hydrazine solution, showing highly stacked layer structure with a thickness of approximately 2 μm due to GOs' high dispersion stability in water, which is consistent with what have been found by others.[S1,S2]

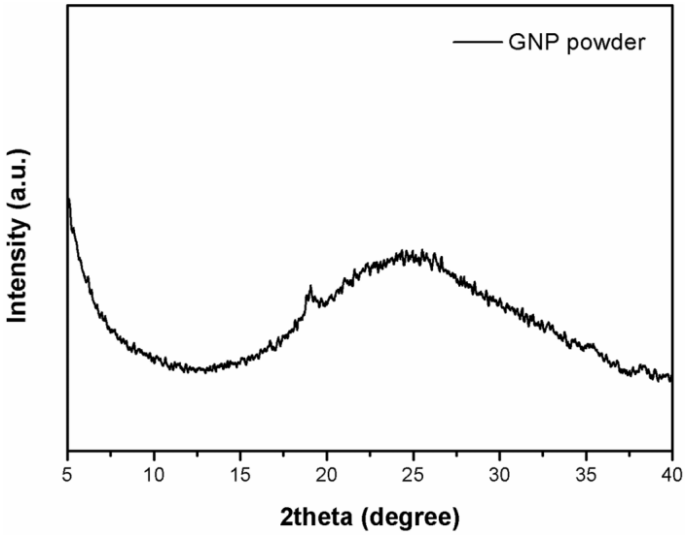

Fig. S2 XRD pattern of GNP powder used in this study, showing only a broad peak around 2θ = 25 °, which indicates poor long-range ordering of graphene sheets like general graphene aerogels. In addition, there was no sharp peak centered at 2θ = 26.5 °, which corresponds to the folded structure of graphene layers. Peak centered at 2θ = 26.5 ° was observed only in the case of the GNP/GO paper, indicating that local folded and corrugated morphology of graphene layers has been developed by the effective control of assembling process with intrinsically wrinkled GNP sheets.

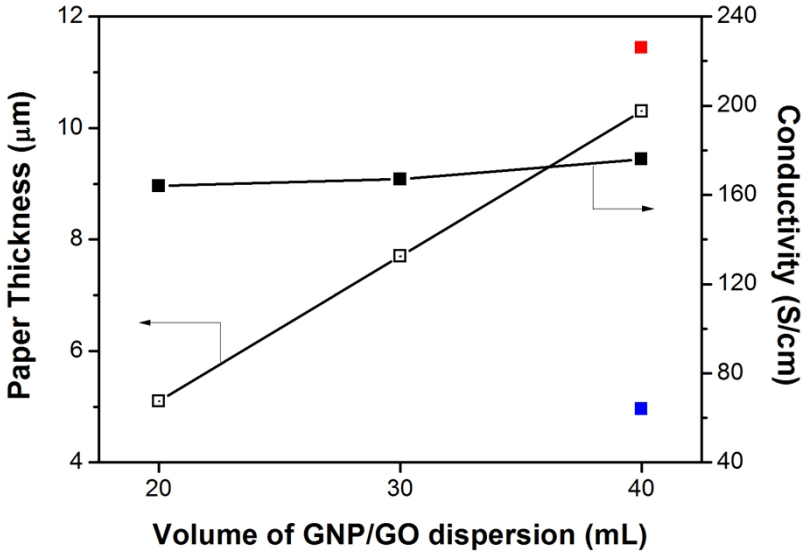

Fig. S3 Thickness of the GNP/GO paper can be controlled by varying the volume of GNP/GO dispersion for a vacuum filtration (filtering diameter: *ca*. 37 mm). Conductivity of the GNP/GO paper was slightly increased as the thickness of the paper was increased. Blue and red squares in the graph indicate the conductivity of papers with 40 mL of GNP/GO dispersion after thermal annealing at 350 °C for 1 h in an air, and with GNP/GO dispersion with a weight ratio of 2/1, respectively.

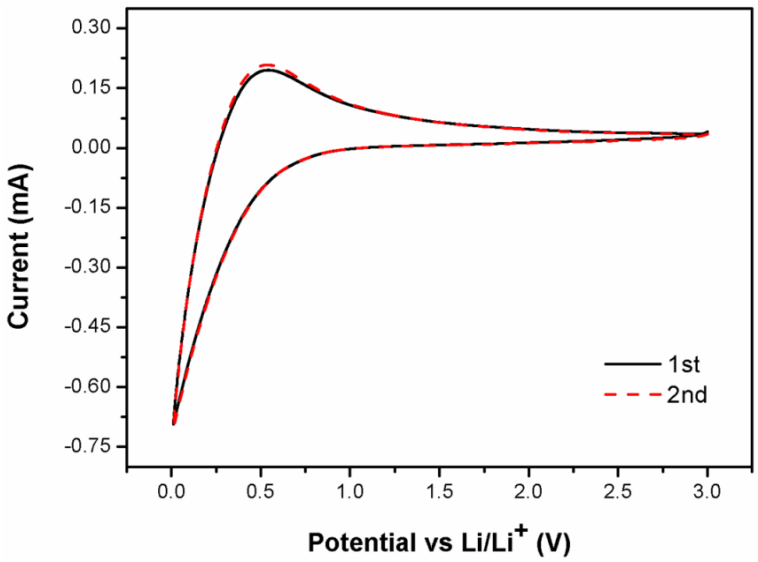

Fig. S4 CV curves for the GNP/GO paper that was thermally annealed at 350 °C for 1 h in an air.

Table S1. BET surface area of the rGO paper, the GNP/GO paper, and pristine GNP powder.

	rGO paper	GNP/GO paper	pristine GNP powder
surface area [m^2 g^{-1}][a]	52.8	278.9	> 400[b]

[a] BET surface areas were determined with a gas sorption analyzer (Belsorp-max).

[b] This value was acquired from a technical data sheet provided from the Angstron Materials.

References

S1 H. Chen, M. B. Müller, K. J. Gilmore, G. G. Wallace, D. Li, *Adv. Mater.*, 2008, **20**, 3557–3561.

S2 C. Wang, D. Li, C. O. Too, G. G. Wallace, *Chem. Mater.*, 2009, **21**, 2604–2606.