Supporting Information

Facile One-step Hydrazine-assisted Solvothermal Synthesis of Nitrogen-doped Reduced Graphene Oxide: Reduction Effect and Mechanisms

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Table S1. FTIR peak assignments and positions (cm^{-1}) for Graphite, GO and RGOs under various reduction conditions. [υ] stretch, [δ] bend, [n/o] not observed.

Peak assignment	Peak position (cm^{-1})				
	graphite	GO	87-95*	0-180	87-180
υ(C-H)	n/o	n/o	2920	2926	2920
υ(C-H_2)	n/o	n/o	2852	2852	2850
υ(C=O)	n/o	1733	1721	1717	n/o
υ(C=C)	1637	1634	1618	1570	1611
υ(C=N)	n/o	n/o	1653	n/o	n/o
δ(C-OH)	n/o	1385	n/o	1376	n/o
υ(C-N)	n/o	n/o	1285	n/o	1293
υ(C-O-C)	n/o	1227	n/o	1220	n/o
υ(C-O)	1089	1090	n/o	n/o	n/o

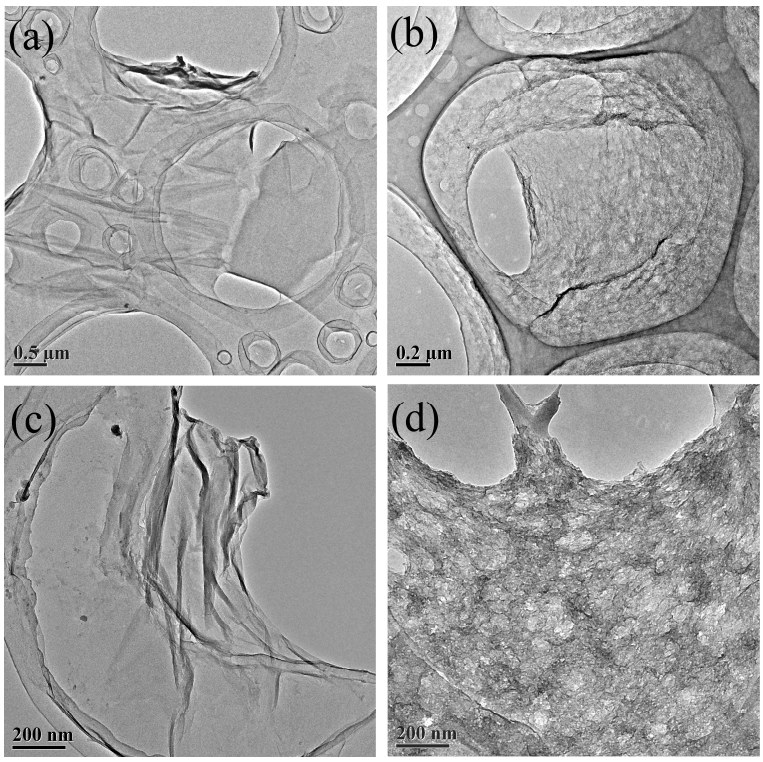

Figure S1. TEM images of RGO sheets: (a) RGO-44-180; (b) RGO-87-180; (c) RGO-200-180; (d) RGO-87-120; (e) RGO-87-150 and (f) RGO-87-200.

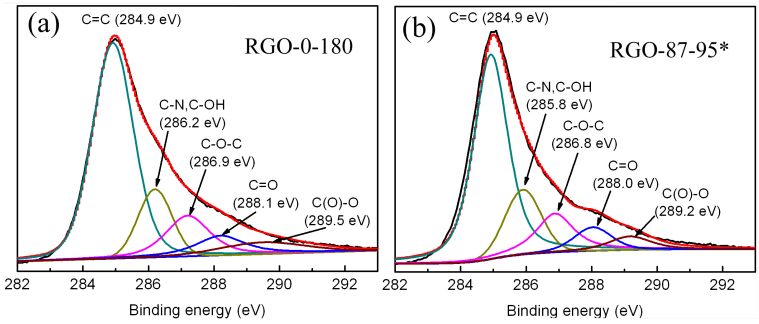

Figure S2. C1s XPS spectra of (a) RGO-0-180 and (b) RGO-87-95*.

The absolute content of individual oxygen-containing functional groups were estimated by the percentage of the certain group (the area of the peak divided by the total area of all peaks for oxygen-containing functional groups, multiplied by 1(for C-OH, and C=O), 1/2 (for C-O-C) or 2 (for O=C-OH)) multiplied by the content of O atoms in the whole materials[1].

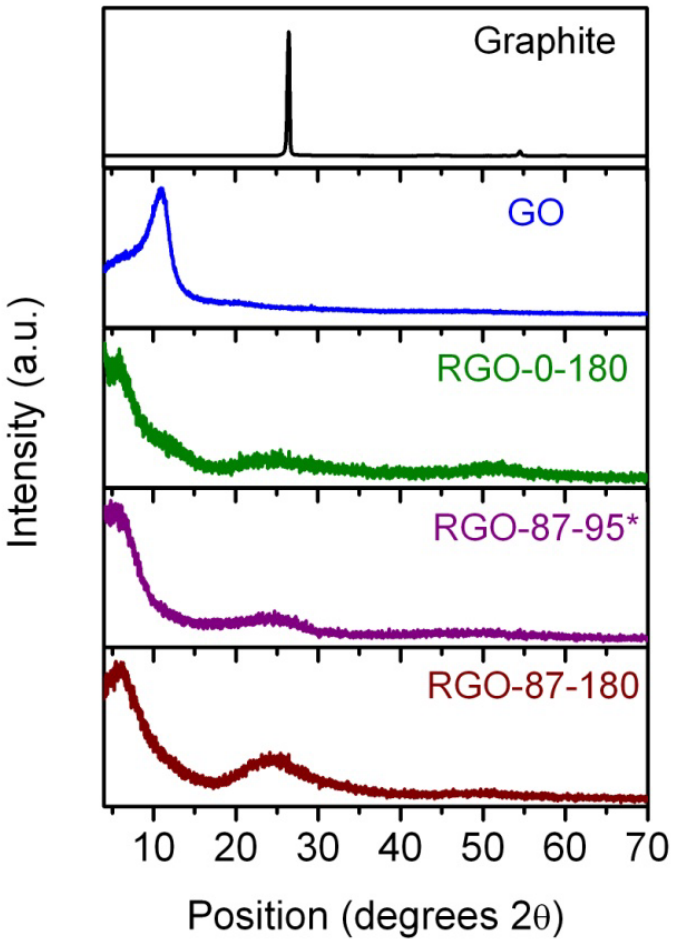

Figure S3. XRD patterns of GO and RGOs. For the pristine graphite, the (002) diffraction peak is at 26.51° and the interplane distance is 3.36 Å. The diffraction peaks of RGOs are at 24.3° for RGO-0-180, 23.9° for RGO-87-95*, 24.8° for RGO-87-180, corresponding to an interlayer d spacing of 3.66 Å, 3.72 Å, 3.58Å, respectively. It is obvious that the *d*-spacing value of RGO-87-180 is the lowest and closest to that of pristine graphite, suggesting the most thorough removal of oxygen-containing groups and recovery of graphitic crystal structure. In addition, the peak of RGO-87-180 is more prominent and shows the most narrow width compared to that of RGO-0-180 and RGO-87-95*, indicating a relatively long domain order or less turbostratic arrangement of graphene stacked sheets[2]. The overall results demonstrate that the hydrazine-assisted solvothermal reduction approach is more efficient in restoring the graphitic crystalline structure than one of them.

References

1. P. G. Ren, D. X. Yan, X. Ji, T. Chen and Z. M. Li, *Nanotechnology*, 2011, **22**.

2. S. Gilje, S. Dubin, K. Wang, V. C. Tung, K. Cha, A. S. Hall, J. Farrar, R. Varshneya, Y. Yang and R. B. Kaner, *Acs Nano*, 2010, **4**, 3845-3852.