# Supporting Information

# A new approach to fabricate graphene nanosheets in organic medium: Combination of reduction and dispersion

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The deoxygenation is further confirmed by XPS. The peak of O1s for GNS-EDA becomes significantly weak in the XPS survey scan spectra as compared with that of EGO. On the contrary, the C1s peak becomes much stronger. Further elemental analysis is obtained from the peak area and sensitivity factor. The calculated results shown in Table 1S illustrate a considerable increase in C/O atomic ratio in the reduced material (7.87) compared to that of the starting GO (2.54), indicating a successful removal of the epoxy and hydroxyl functional groups after reduction of EGO. In addition to the decrease in the oxygen level, reduction of GO is accompanied by nitrogen incorporation from the reducing agent of EDA. As a result, an N1s peak of amino groups appeared at ca. 400.6 eV (C/N=11.38) in XPS.

Table 1S Concentrations of various elements of a) EGO and b) GNS-EDA.

| Samples | Concentration of various elements (%) | | | C/O | C/N |
|---|---|---|---|---|---|
| | C | O | N | | |
| EGO | 70.79 | 27.84 | 1.36 | 2.54 | 52.05 |
| GNS-EDA | 82.30 | 10.46 | 7.23 | 7.87 | 11.38 |

The deconvolve XPS peak of aromatic/conjugated C resumed after reaction as seen from Table 2S (carbon level from 60.87% in EGO to 72.54% in GNS-EDA). It indicates that considerable de-oxygenation and partial restoration of the $sp^2$ carbon sites occured in the reduction process.

Table 2S Components of C1s spectra of a) EGO and b) GNS-EDA

| Samples | C=C | C-OH | C-N | C-O-C | C=O | O-C=O |
|---|---|---|---|---|---|---|
| Binding Energy (eV) | 284.50 | 285.60 | 286.20 | 286.90 | 288.10 | 289.00 |
| EGO | 60.87 | 10.71 | — | 19.39 | 6.40 | 2.64 |
| GNS-EDA | 72.54 | 6.31 | 5.97 | 7.48 | 4.12 | 3.58 |

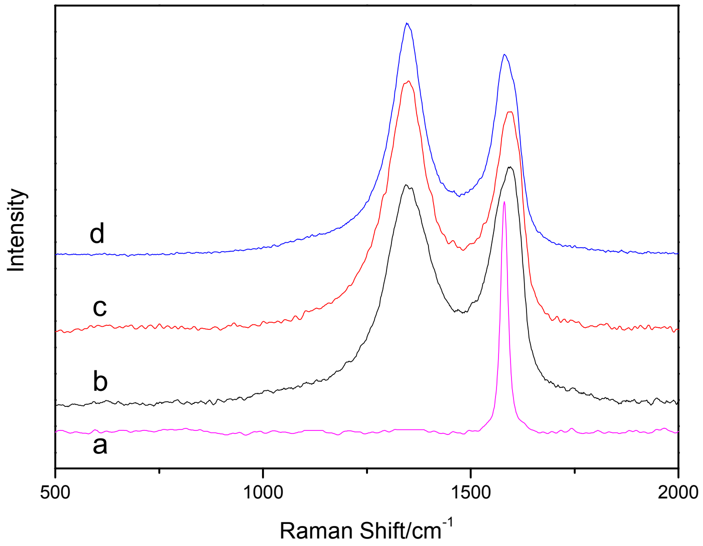

Figure 1S Raman spectra of a) graphite, b) EGO, c) GNS-EDA and d) GNS-HH

Significant structural changes occurring during the chemical reaction from pristine graphite to EGO, and then to the reduced GNS-EDA and GNS-HH, are also reflected in their Raman spectra (Figure 1S). We find that all the graphene samples give a similar Raman spectrum in terms of the shapes and positions of Raman peaks. They exhibit a strong D line around 1350 cm$^{-1}$, representing a breathing mode of κ-point photons of $A_{1g}$ symmetry, and a relatively weak G line around 1600 cm$^{-1}$, which should be assigned to the first order scattering of the $E_{2g}$ phonon of sp$^2$ C atoms. However, $I_D/I_G$ of GNS-EDA increases compared to that in EGO, which is as same as GNS-HH does (Table 3S). Many previous papers reported that the change suggested a decrease in the size of the in-plane sp$^2$ domains and a partially ordered crystal structure of the graphene nanosheets, and could be explained if new graphitic domains were created that are smaller in size to the ones present in EGO before reduction, but more numerous in number[1, 2]. The resulsts are consistent with the XPS and FTIR analyses, implying that the structure of the graphene nanosheets remains intact after EDA reduction.

Table 3S Relative strength and position of D line and G line in EGO, GNS-EDA and GNS-HH

| Samples | $\omega_D$/cm$^{-1}$ | $\omega_G$/cm$^{-1}$ | $I_D/I_G$ |
|---|---|---|---|
| EGO | 1349 | 1594 | 0.93 |
| GNS-EDA | 1346 | 1594 | 1.16 |
| GNS-HH | 1349 | 1584 | 1.28 |

**Reference**

[1] S. Stankovich, D. A. Dikin, R. D. Piner, K. A. Kohlhaas, A. Kleinhammes, Y. Jia, Y. Wu, S. T. Nguyen and R. S. Ruoff, *Carbon* **2007**, 45, 1558-1565.

[2] G. Wang, X.Shen, B.Wang, J. Yao, J.Park, *Carbon* **2009**, 47, 1359-1364.