Supplementary Material:

Structural Characterization of Graphene Oxide: Surface Functional Groups and Fractionated Oxidative Debris

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Contents

$$NaNO_3 + H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$$

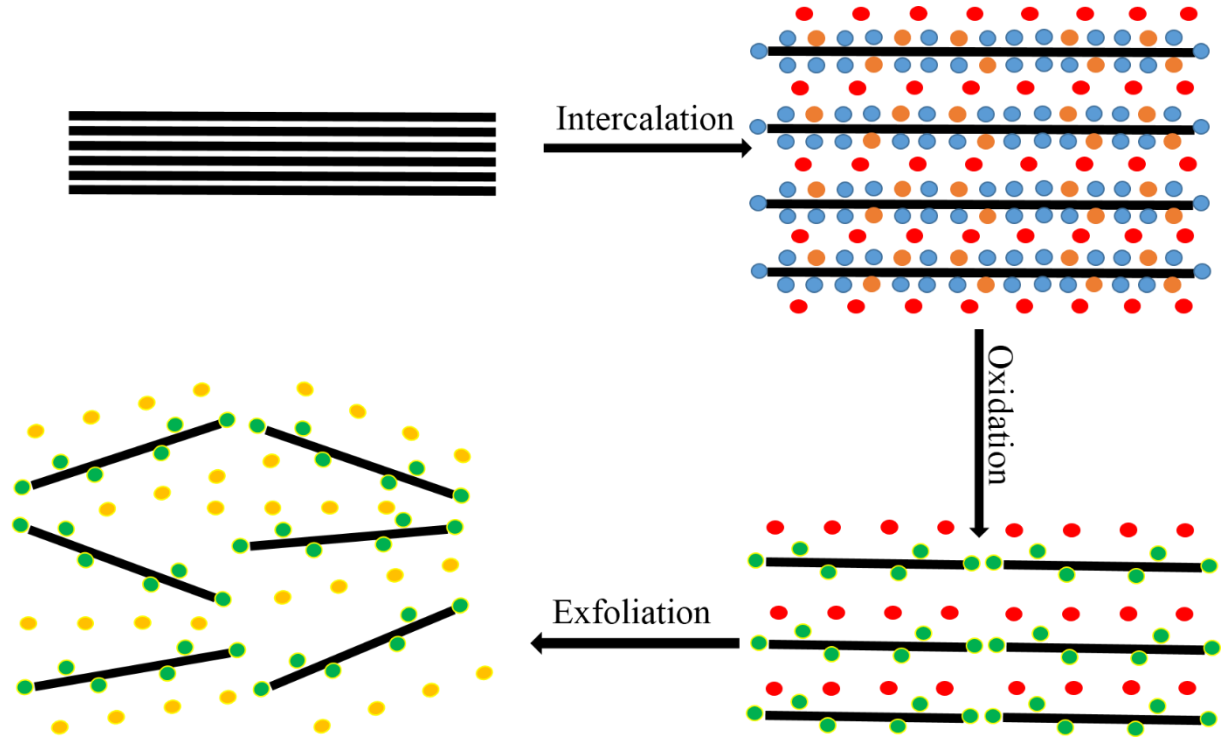


Figure S1. Intercalation, oxidation and exfoliation of graphene oxide layers: ● - $HSO4^-$, ● - NO_3^- ; ● - Na^+; ● - oxygen functionalities; ● - oxidative debris.

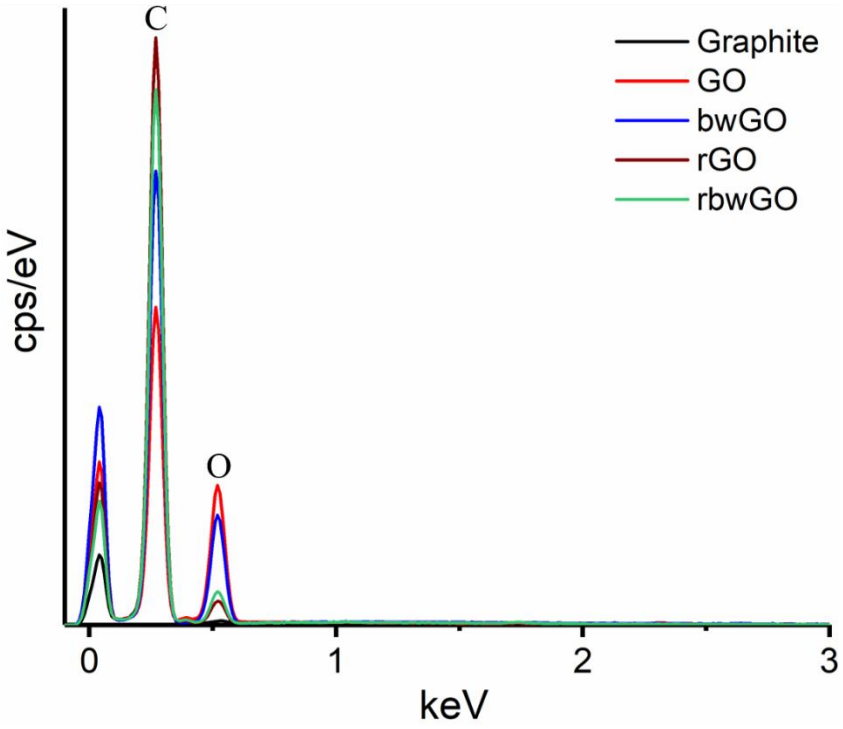


Figure S2. EDX results for graphene oxide samples.

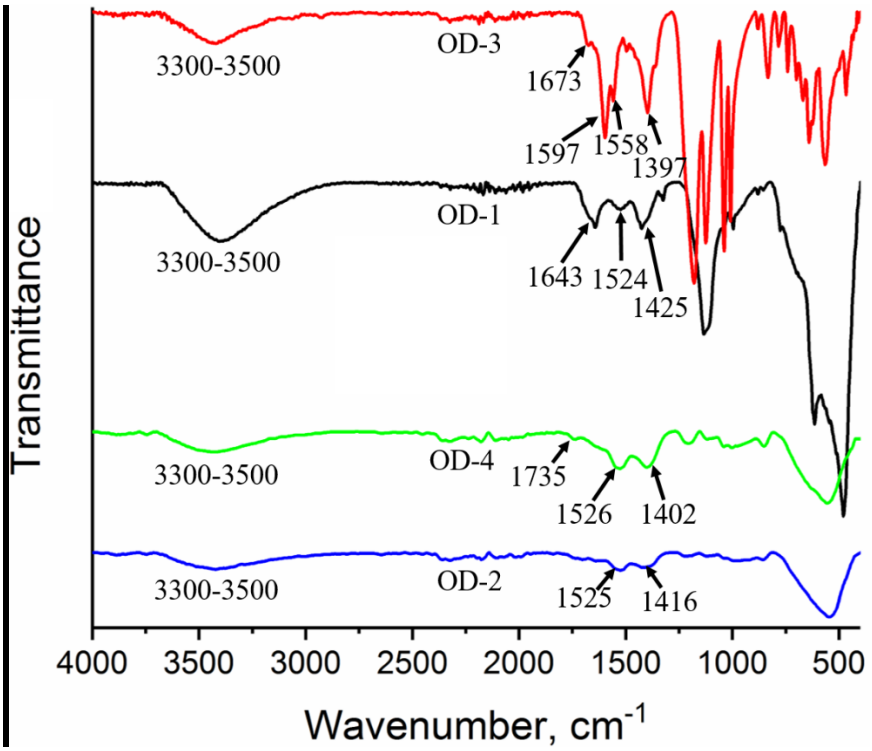


Figure S3. FTIR spectra of oxidative debris.

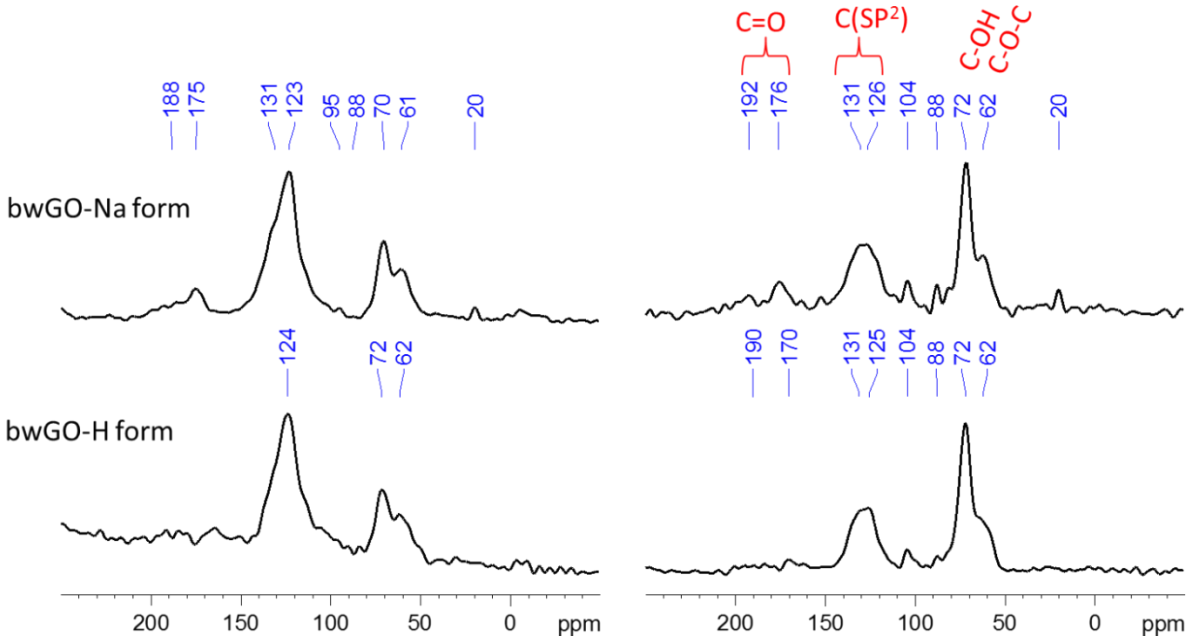


Figure S4. Direct excitation ^{13}C MAS NMR (left) and $^{13}C\{^{1}H\}$ CP MAS NMR (right) spectra of base-washed graphene oxide (sodium and hydrogen forms).

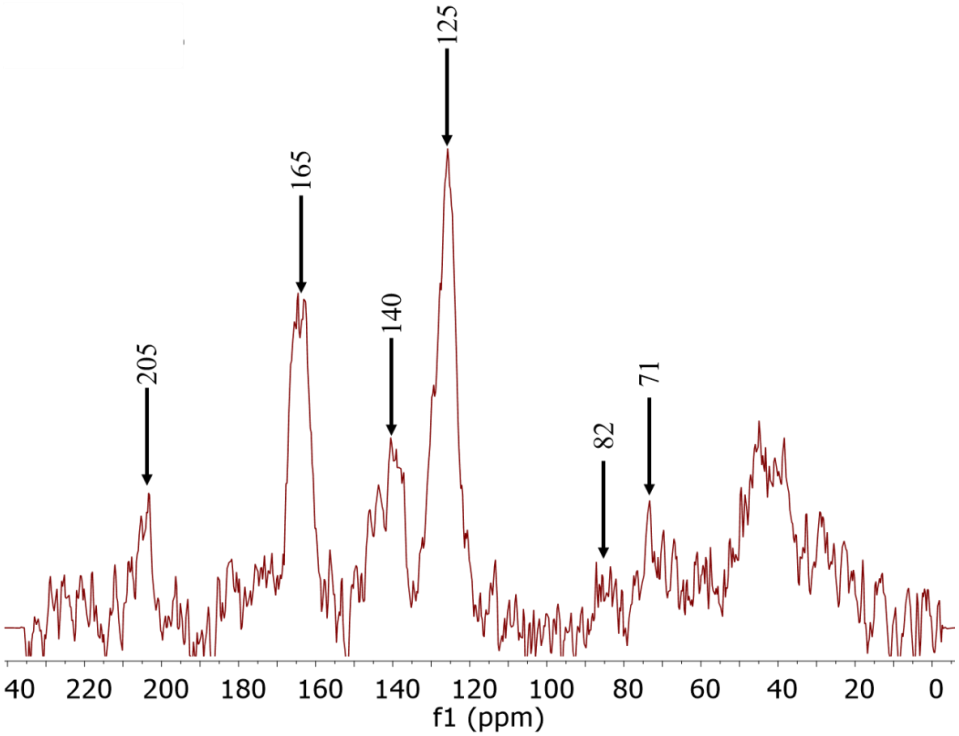
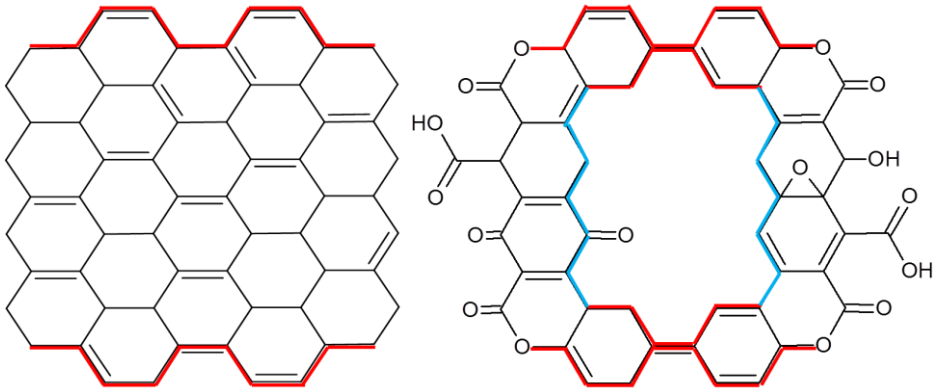


Figure S5. $^{13}C\{^{1}H\}$ CP MAS NMR spectrum of OD-1.



graphene graphene oxide

Figure S6. Lattice model for the edges and round hole. Red and blue lines mark armchair and zigzag edges, respectively.

Table S1. Elemental composition of graphene oxide samples.

Samples	Elements by % weight			C/O ratio	C/H ratio
	C	H	O		
Graphite	99.6	0.4	-	-	0.4
GO	47.1	4.4	47.6	1.32	0.89
rGO	85.5	0.84	9.6	11.9	8.48
bwGO	55.0	2.4	39.2	1.87	1.91
rbwGO	78.8	1.27	14.8	7.1	5.17

Table S2. Raman results for graphene oxide samples.

Samples	Raman peaks, cm^{-1}					ID/IG	I2D/IG
	D-band	G-band	2D-band	D+D'-band	2D'-band		
Graphite	1359	1578	2713	-	3240	~0.08	~5.6
GO	1356	1592	2683	2920	3204	~0.92	~0.05
rGO	1351	1584	2685	2939	-	~1.47	~0.19
bwGO	1342	1583	2708	2920	3183	~0.97	~0.11
rbwGO	1343	1575	2684	2916	3165	~1.2	~0.09

Table S3. XRD analysis results.

Samples	2θ max. (002)	FWHM(La)	La (nm)	d (nm)	N	2θ max. (100)	FWHM(Lc)	Lc (nm)
Graphite	26.6	0.66	12.9	0.34	38	44.6	0.66	13.6
GO	10.7	6.72	1.24	0.83	2	42.5	7.14	1.25
rGO	-	-	-	-	-	-	-	-
bwGO	13.8	11.37	0.74	0.65	1	42.9	13.19	0.68
rbwGO	-	-	-	-	-	-	-	-

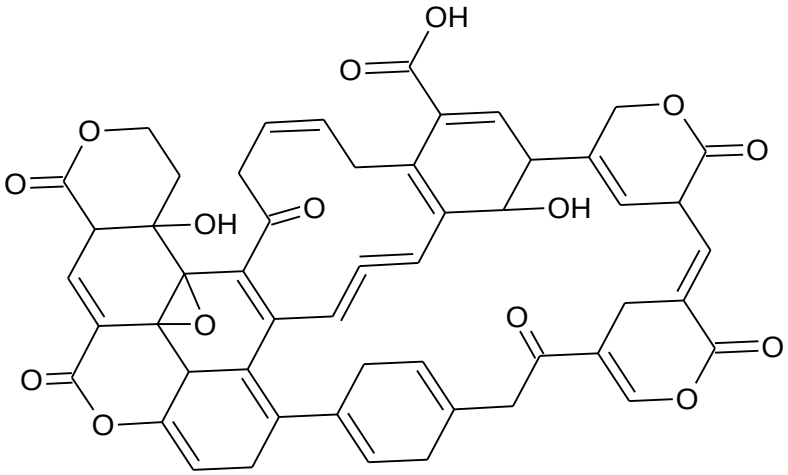


Figure S7. Possible structure of oxidative debris.

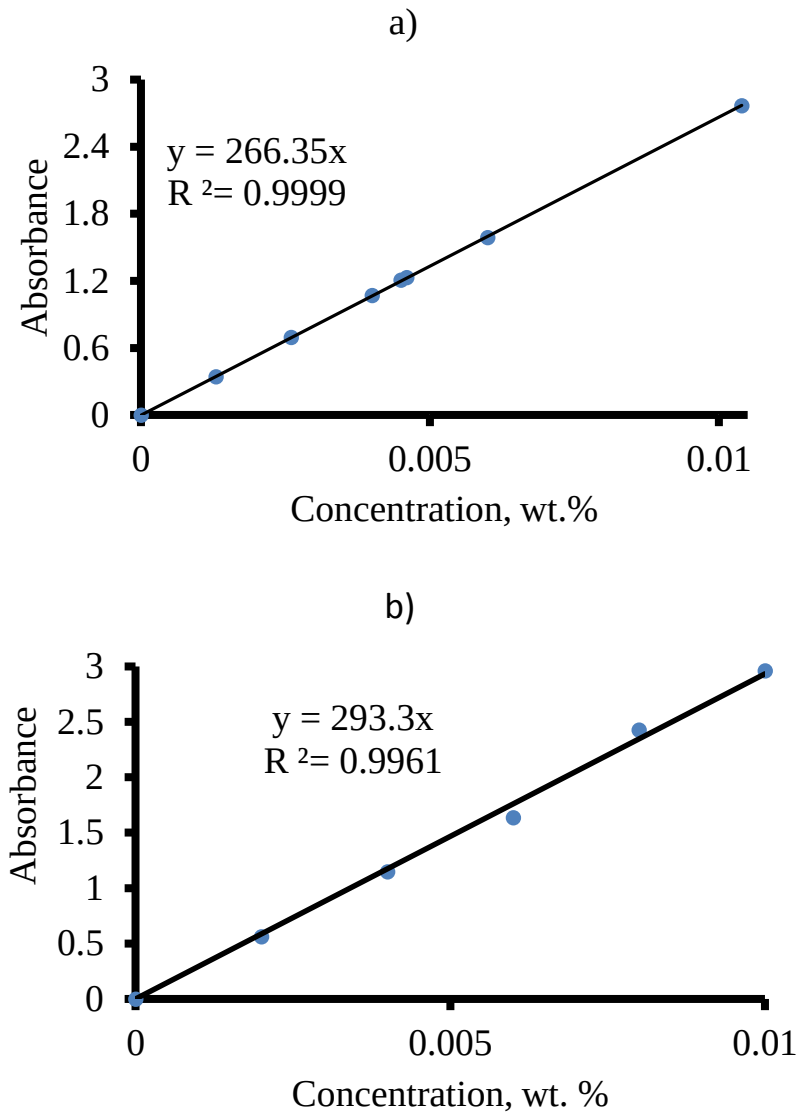


Figure S8. Correlation between absorbance and concentration of GO (a) and bwGO (b) solutions obtained at 600 nm on an UVmini – 1240 spectrophotometer.