

Electronic Supplementary Information (ESI) for New Journal of Chemistry

Efficient Dye Removal and Separation Based on Graphene Oxide Nanomaterials

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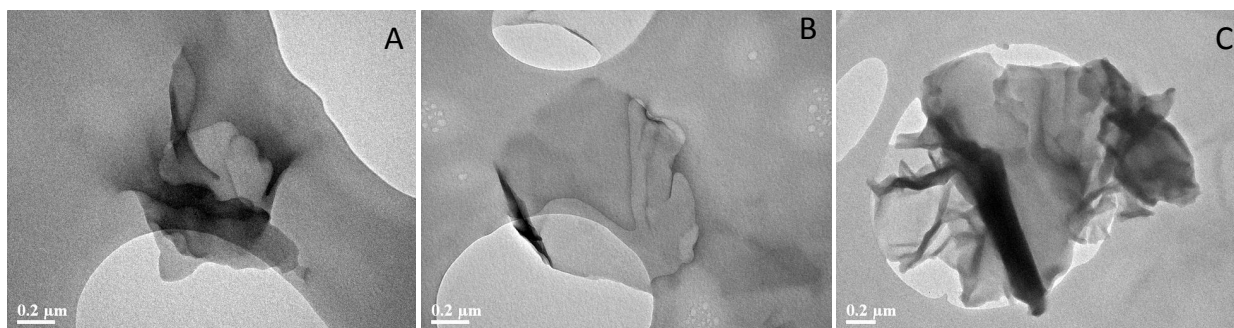


Figure S1. TEM images of A) GO, B) F-GO, C) IC-rGO.

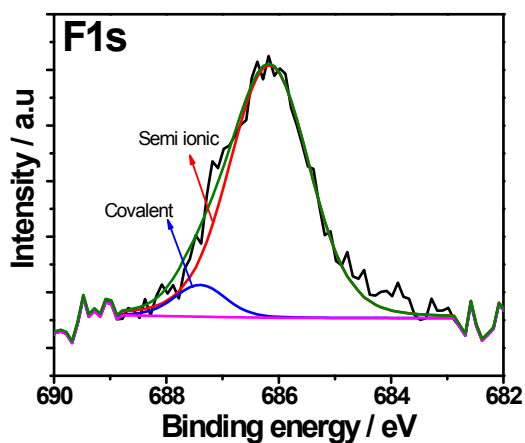


Figure S2. XPS spectra of F1s of F-GO.

Table S1. Quantitative distribution of components in de-convoluted C1s spectra of GO, F-GO and IC-rGO from Figure 3.0.

Material	C=C (%)	C-C (%)	C-O (%)	C=O (%)	O-C=O (%)	π - π^* (%)
Graphite	88.71	10.64	-	-	-	0.65
GO	27.93	7.04	32.04	21.17	11.80	-
F-GO	30.40	13.64	40.29	10.15	5.51	-
IC-RGO	54.8	11.7	15.9	7.8	9.8	-

Table S2: Kinetic parameters in the pseudo-second order model of MB adsorption on various adsorbents.

Adsorbent	Pseudo-first-order				Pseudo-second-order		
	$q_{e, \text{exp}} / \text{mg g}^{-1}$	$q_{e, \text{cal}} / \text{mg g}^{-1}$	k_1 / min^{-1}	R^2	$q_{e, \text{cal}} / \text{mg g}^{-1}$	$k_2 / \text{g mg}^{-1} \text{min}^{-1}$	R^2
Graphite	15.01	44.74	0.02610	0.7634	45.13	0.0007258	0.9229
GO	239.7	19.76	0.08816	0.8755	242.2	0.008377	0.9999
F-GO	228.2	21.73	0.03063	0.9581	231.3	0.003760	0.9999
IC-rGO	78.78	32.18	0.01180	0.7226	69.78	0.002421	0.9920

Table S3: Comparison of the adsorption isotherm constants of RhB with literature reported adsorbents.

Adsorbent	Langmuir				Freundlich			Reference
	$Q_{\max}/$ mg g^{-1}	k_L / L mg^{-1}	$\Delta G / \text{kJ}$ mol^{-1}	R^2	n	k_F / L g^{-1}	R^2	
Graphite	33.58	0.0100	-33.0	0.959	2.263	2.065	0.845	Current work
GO	686.57	13.619	-40.0	0.942	4.336	373.20	0.786	Current work
F-GO	321.96	13.180	-38.8	0.960	4.738	210.62	0.902	Current Work
IC-rGO	60.59	0.0246	-33.2	0.956	2.7026	7.4252	0.968	Current work
Tannic acid-graphene	201.207	0.0276	-	0.9981	8.666	1.705	0.9248	S1
divinylbenzene and 1-vinylimidazolate	260.42	0.946	-	0.9960	3.40	109.15	0.9271	S2
Gelatin/Activated carbon	243.90	0.013	-	0.994	2.62	26.24	0.979	S3

Table S4: Kinetic parameters in the pseudo-second order model of RhB adsorption on various adsorbents.

Adsorbent	Pseudo-first-order				Pseudo-second-order		
	$q_{e, \text{exp}} / \text{mg g}^{-1}$	$q_{e, \text{cal}} / \text{mg g}^{-1}$	k_1 / min^{-1}	R^2	$q_{e, \text{cal}} / \text{mg g}^{-1}$	$k_2 / \text{g mg}^{-1} \text{min}^{-1}$	R^2
Graphite	18.59	31.05	0.005484	0.8793	46.95	0.0017414	0.9761
GO	234.0	15.53	0.040713	0.7455	232.9	0.029768	0.9999
F-GO	230.9	89.27	0.009787	0.8240	229.6	0.012016	0.9999
IC-rGO	44.46	26.10	0.007969	0.6223	61.20	0.002343	0.9715

Table S5: Summary of wavenumber of various vibration modes in FTIR and the D and G band shifts in Raman spectroscopy.

Sample	$\nu_{\text{O-H stretch}} / \text{cm}^{-1}$	$\nu_{\text{C=O stretch}} / \text{cm}^{-1}$	$\nu_{\text{C=C stretch}} / \text{cm}^{-1}$	D band Raman Shift / cm^{-1}	G band Raman Shift / cm^{-1}
GO	3382.6	1724.1	1624.1	1354.8	1591.6
GO-MB	3357.5	1717.3	1597.7	1367.7	1590.4
GO-RhB	3367.2	1718.3	1588.3	1346.6	1590.7
F-GO	3375.8	1733.8	1623.4	1343.5	1601.0
F-GO-MB	3357.9	1733.9	1597.5	1355.5	1592.9
F-GO-RhB	3355.5	1717.2	1590.0	1354.4	1586.4
IC-rGO	-	1718.9	1575.6	1348.7	1589.4
IC-rGO-MB	-	1716.9	1558.2	1348.8	1590.7
IC-rGO- RhB	-	1718.3	1583.2	1348.8	1592.9

Reference

- [S1] K. Liu, H. Li, Y. Wang, X. Gou, Y. Duan. *Colloids Surfaces A Physicochem. Eng. Asp.* 2015, **477**, 35-41.
- [S2] Y. Han, W. Li, J. Zhang, H. Meng, Y. Xu, X. Zhang. *RSC Adv.* 2015, **5**, 104915-104922.
- [S3] F. Hayeeye, M. Sattar, W. Chinpa, O. Sirichote, *Colloids Surfaces A Physicochem. Eng. Asp.* 2017, **513**, 259-266.