

## Supplementary material

# Synthesis of Graphite Oxide with Different Surface Oxygen Contents Assisted Microwave Radiation

Adriana Ibarra-Hernández <sup>1</sup>, Alejandro Vega-Rios <sup>1</sup> and Velia Osuna <sup>2,\*</sup>

<sup>1</sup> Centro de Investigación en Materiales Avanzados, S.C., Miguel de Cervantes No. 120, Chihuahua 31136, Chihuahua., Mexico; adriibarra26@gmail.com (A.I.-H.); alejandro.vega@cimav.edu.mx (A.V.-R.)

<sup>2</sup> Consejo Nacional de Ciencia y Tecnología (CONACYT)-Centro de Investigación en Materiales Avanzados, S.C., Miguel de Cervantes No. 120., Chihuahua 31136, Chihuahua., Mexico

\* Correspondence: velia.osuna@cimav.edu.mx; Tel.: +52-614-439-4832

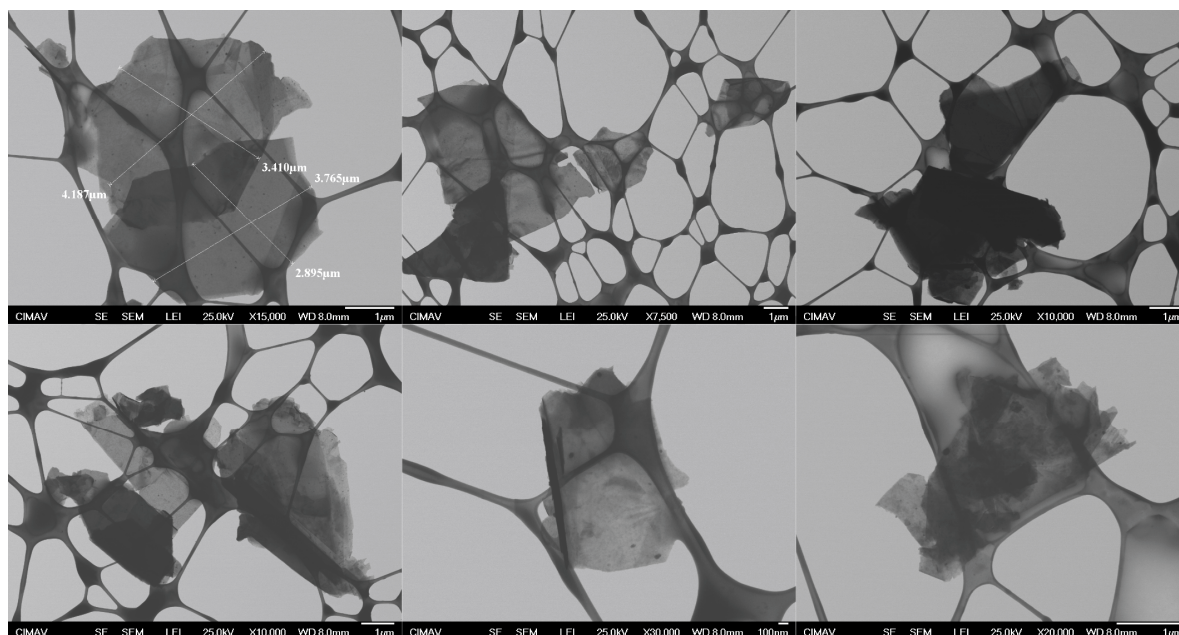
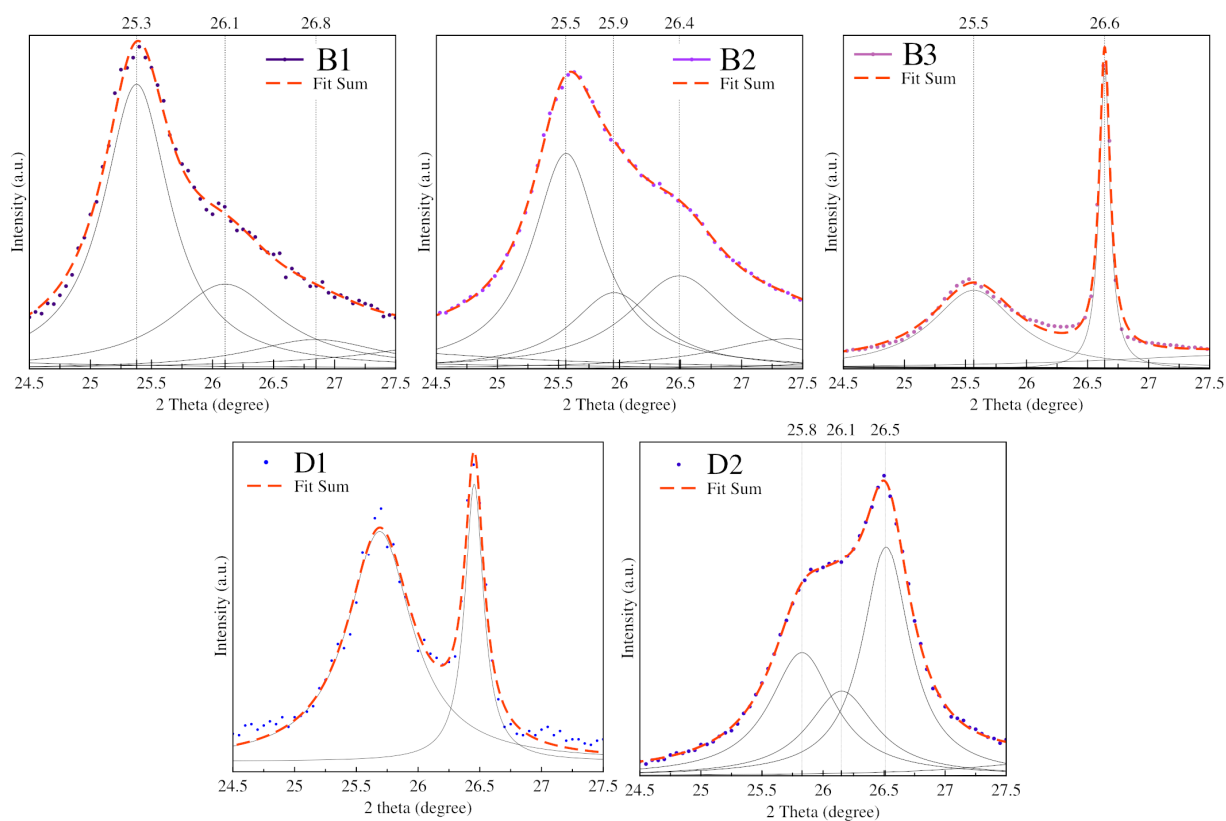


Figure S1. FESEM micrographs of ground graphite.

Table S1. Results of the diffraction patterns and interplanar distance of all methods.

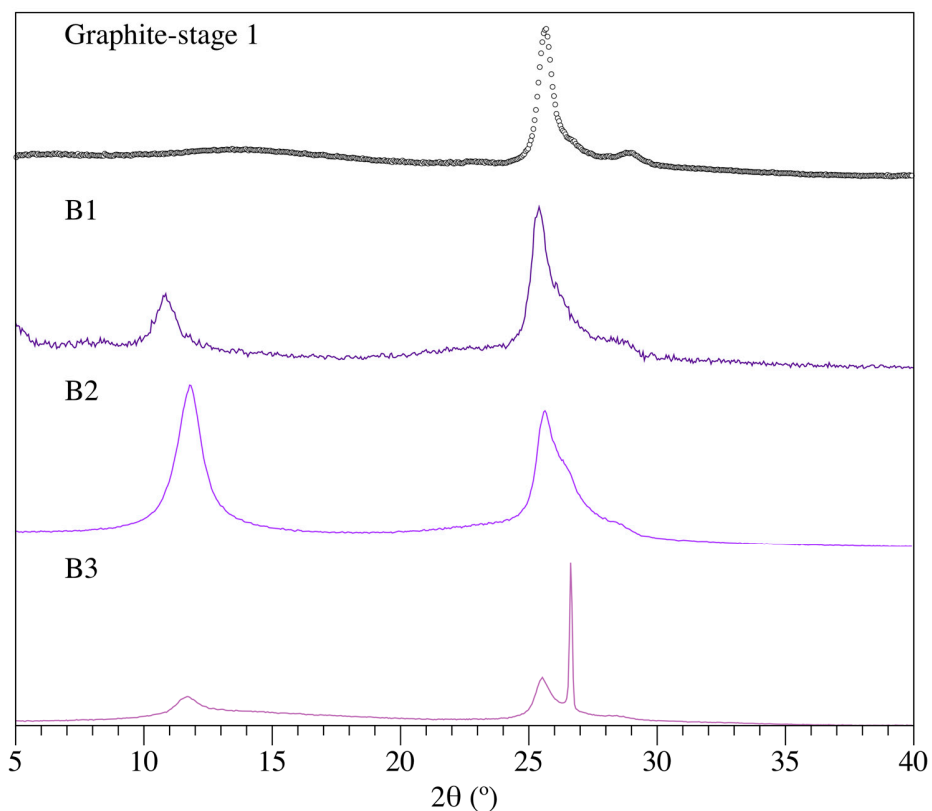
Sample	Peak 1	d (Å)	Peak 2*	d (Å)	Peak 3*	d (Å)	Peak 4	d (Å)
Method A								
cGO	11.38	7.81	—	—	—	—	26.50	3.34
Method B								
B1	10.85	8.20	25.30	3.60	26.10	3.50	26.80	3.41
B2	11.80	7.53	25.50	3.57	25.90	3.53	26.40	3.46
B3	11.70	7.60	25.55	3.57	—	—	26.60	3.44
Method C								
C1	10.60	8.38	—	—	—	—	—	—
C2	10.60	8.38	—	—	—	—	—	—
Method D								
D1	10.4	8.53	—	—	—	—	—	—
D2	—	—	25.80	3.54	26.10	3.50	26.50	3.45



**Figure S2.** Deconvolution of the X-ray diffraction patterns in the range 24–27° from samples B1, B2, B3 (methodology B) and the samples D1, D2 (methodology D).

### Deconvolution

The deconvolution of the diffractograms and Raman spectra were made using the software MagicPlot ver. 2.7.2 with 10000 interactions. Red line indicates a summation of curves deconvolution (Fit Sum), and solid black line represents the original experimental intensity from the background. Dotted black lines represent the assigned curves.

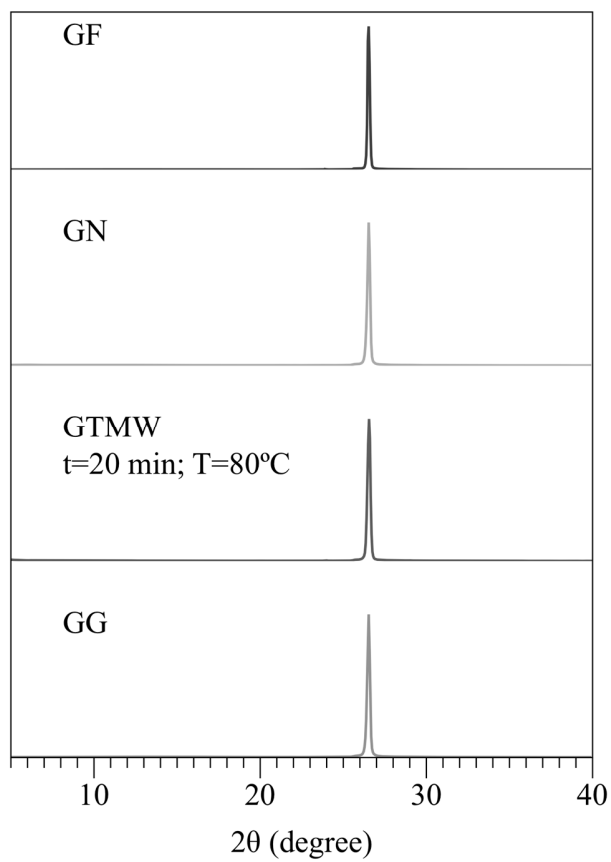


**Figure S3.** X-ray diffraction patterns of Graphite-stage 1 compared with B1, B2, B3.

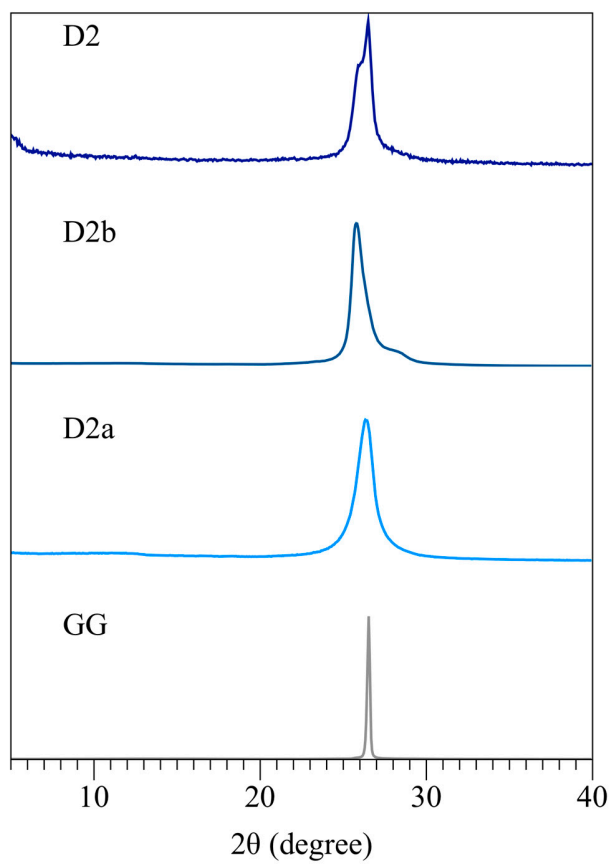
**Table S2.** Water conductivity before and after microwave radiation\*.

Sample	Description	Temperature (°C)		Conductivity (μS)		pH	
		Before	After	Before	After	Before	After
Water	Water	17.5	17.6	9	13	7	7
GFT	Water + GF	22.1	22.0		57	7	7
GTMW	Water + GG		21.9		45	7	7
GNT	Water + GN		22.1		53	7	7

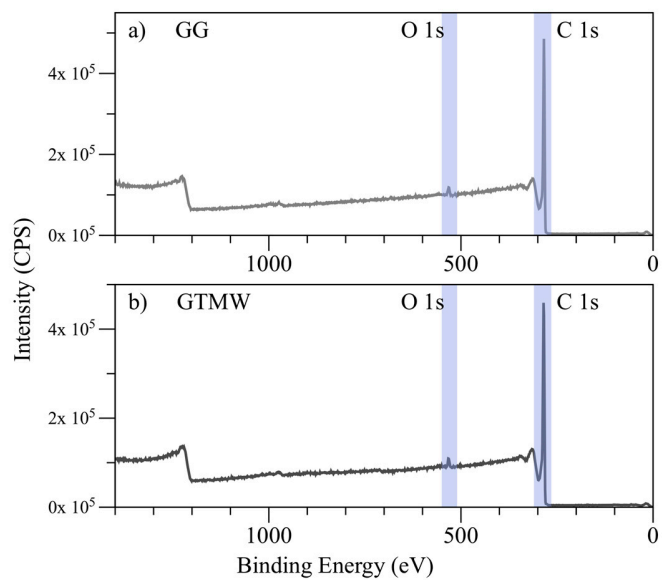
\* The conditions of microwave radiation were at t=20 min and T=80°C.



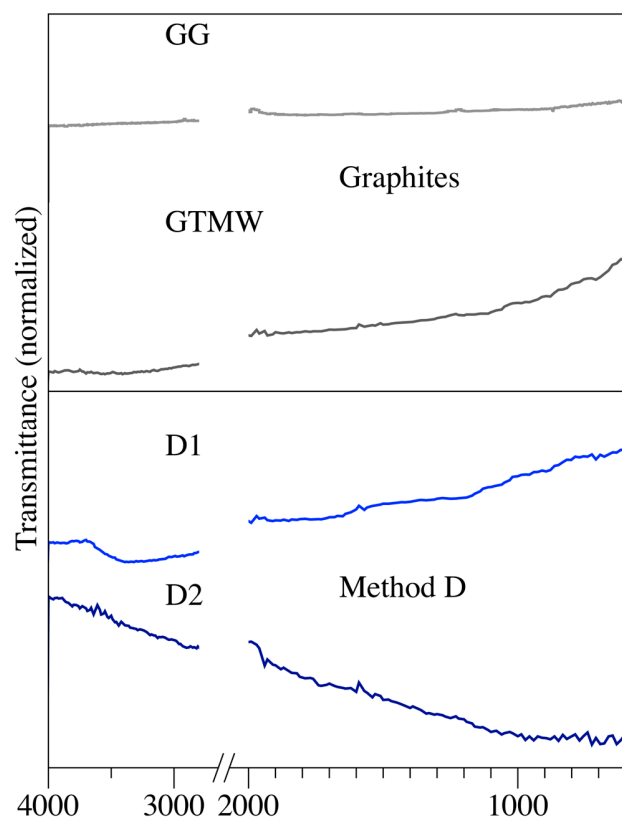
**Figure S4.** X-ray diffraction pattern of the ground graphite (GG), graphite treated with MW (GTMW), natural graphite (GN) and flakes graphite (GF).



**Figure S5.** X-ray diffraction pattern from samples D2; D2b; D2a; GG.



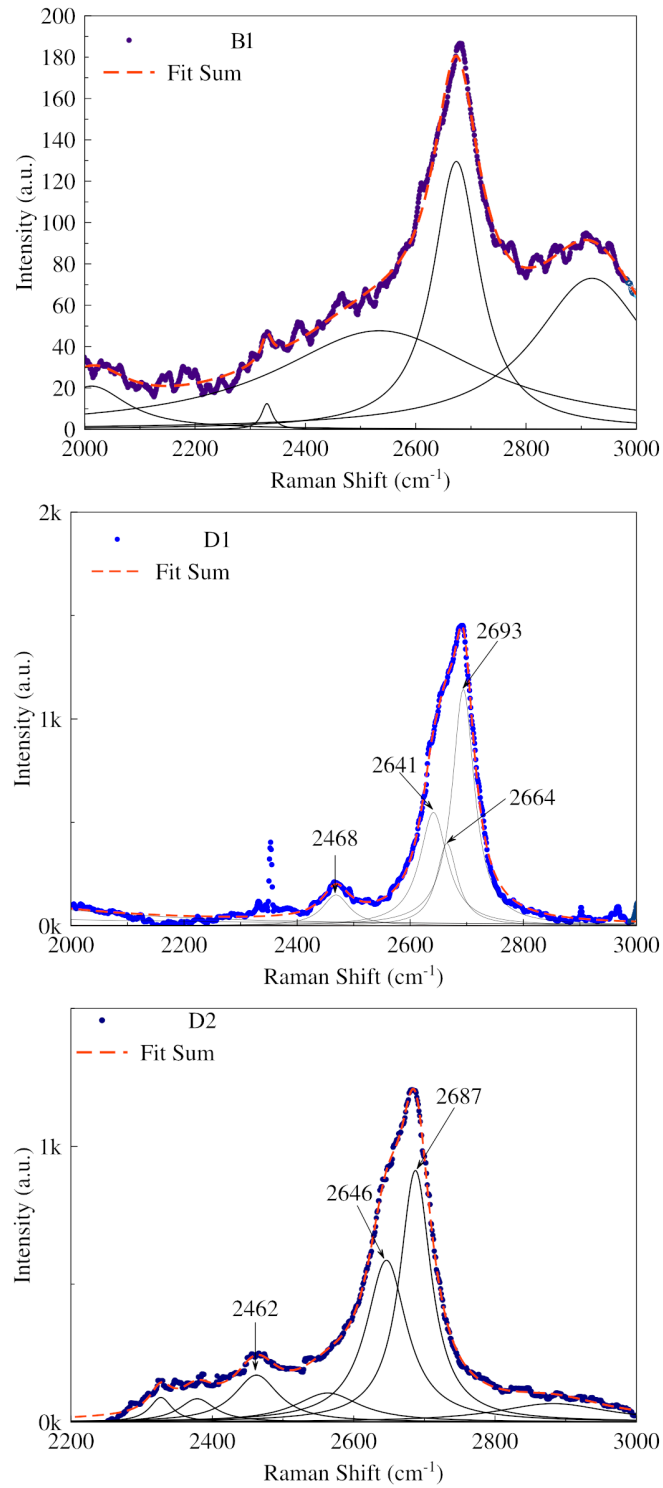
**Figure S6.** XPS survey spectrum of GG and GTMW.



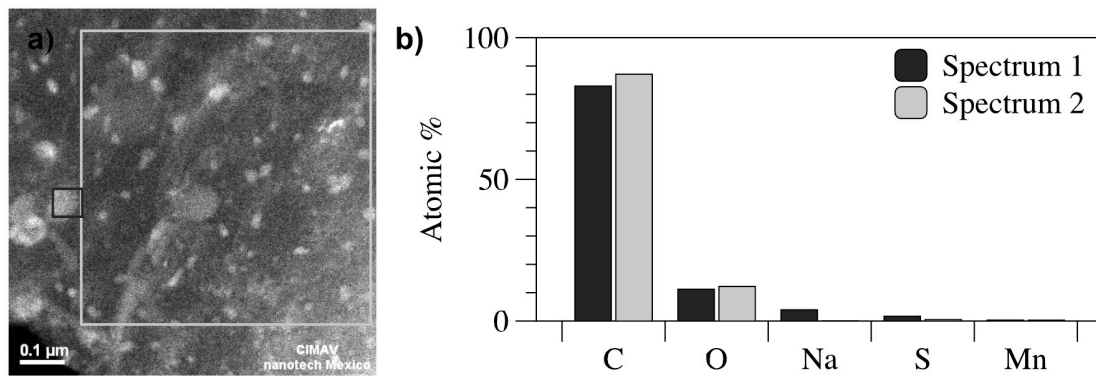
**Figure S7.** FTIR spectrum of graphites (GG, GTMW) and the samples D1, D2 (methodology D).

**Table S3.** Peak ratio intensities of  $I_D/I_G$  and  $I_{2D}/I_G$ .

Sample	$I_D/I_G$	$I_{2D}/I_G$
cGO	1.12	0.10
B1	0.79	0.34
B2	1.10	0.14
B3	0.99	0.22
C1	1.20	0.14
C2	1.07	0.13
D1	0.10	0.37
D2	0.20	0.42



**Figure S8.** Raman spectra deconvolution, band 2D, from samples B1, D1 and D2.



**Figure S9.** (a) High-resolution TEM micrograph in STEM mode analyzing two areas of the sample D2; (b) EDS elemental analysis of the micrograph.