colloids and interfaces

MDPI

Article

Production of Graphene Stably Dispersible in Ethanol by Microwave Reaction

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All sample was analyze with Thermo-gravimetric coupled infrared absorption analyses (TGA-IR) were carried out in a Thermo-gravimetric Analyzer NETZSCH TG 209 F1 coupled by a transfer line heated at 230 °C with an Infrared spectrometer Bruker TENSOR II equipped with an IR gas cell heated at 200 °C. The tests were performed heating from 30 °C to 800 °C with a rate of 20 °K min^{-1} about 3 mg sample in alumina pans, under nitrogen flux of 40 mL min^{-1}. Before the test three vacuum cycle were performed to purge from air and remove solvent impurities on the surface of the materials. Experimental weight error, is between ±1%. The FTIR analysis was collected in the absorbance mode in the range 650–4400 cm^{-1}. Every sample has a starting weight between 2 mg and 3 mg.

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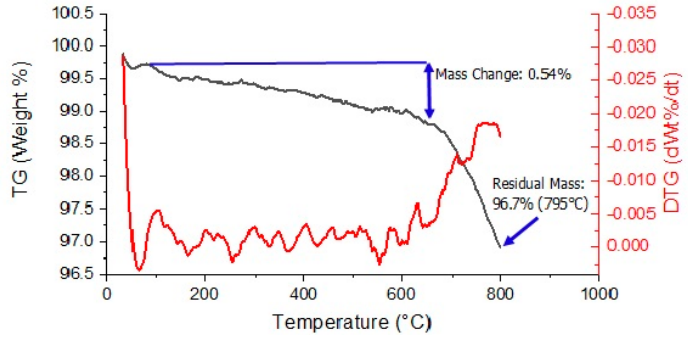
Graphite.



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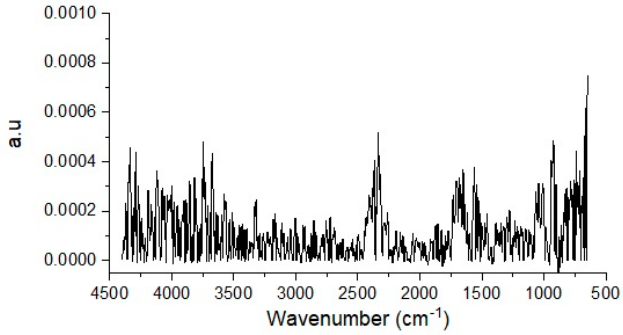

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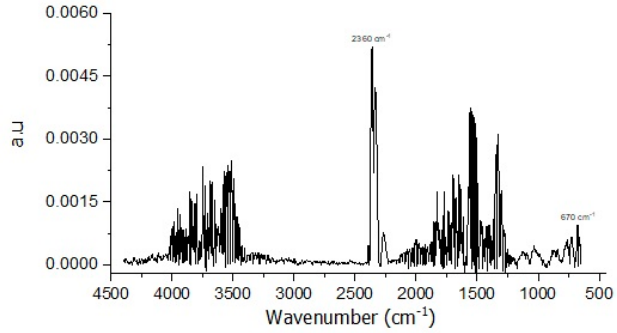

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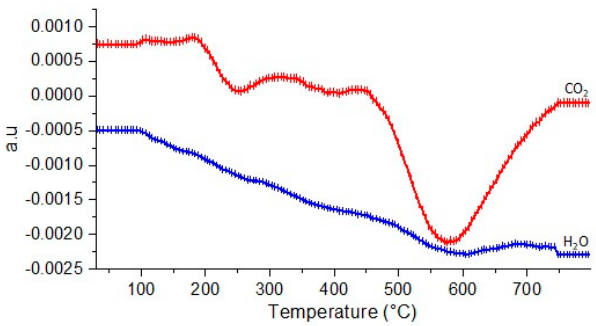
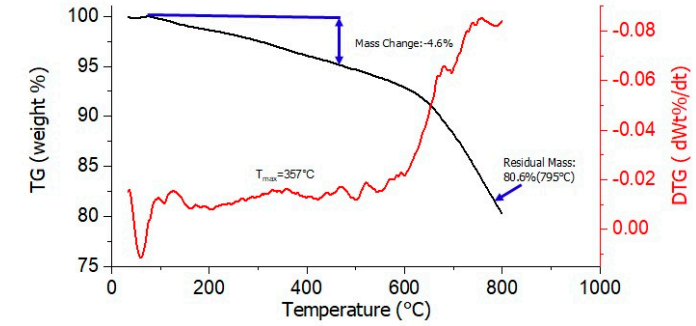


(**d**)

Figure S1. (**a**) Thermal degradation of graphite (**b**) Gas infrared spectra correlated with the degradation of graphite at 380°C (**c**) the gas infrared spectra correlated with the final degradation at 798 °C and (**d**) the kinetics devolution of CO_2 and H_2O during the heating

Graphene



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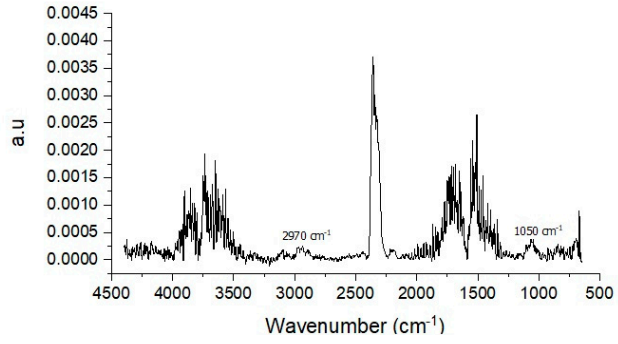

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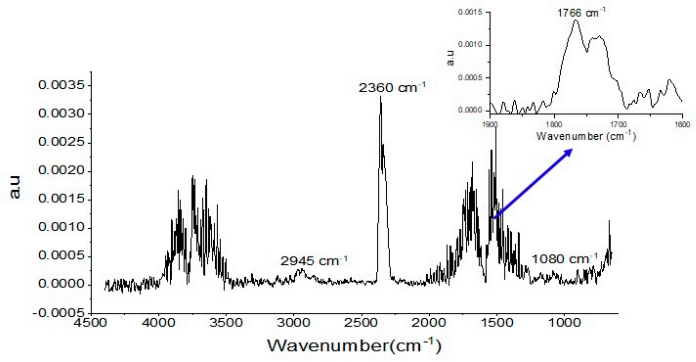

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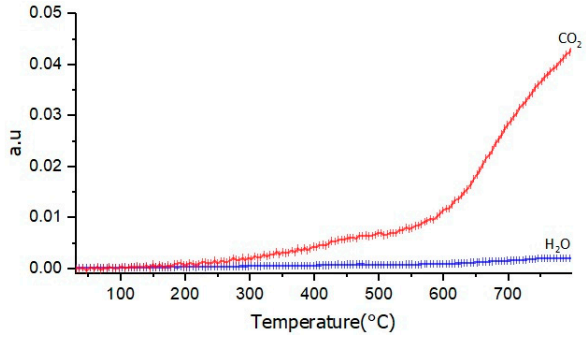
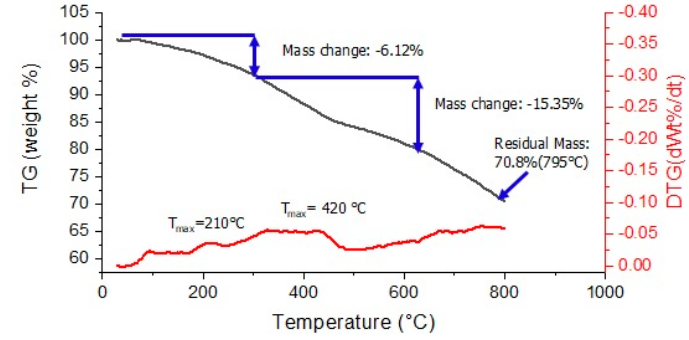


(**d**)

Figure S2. (a) Thermal degradation of exfoliated graphene(EG) (**b**) Gas infrared spectra correlated with the degradation of EG at 380 °C , (**c**) the gas infrared spectra correlated with the final degradation at 798 °C and (**d**) the kinetics devolution of CO_2 and H_2O during the heating of the sample

GEM reaction with AIBN (Azobisisobutyronitrile)



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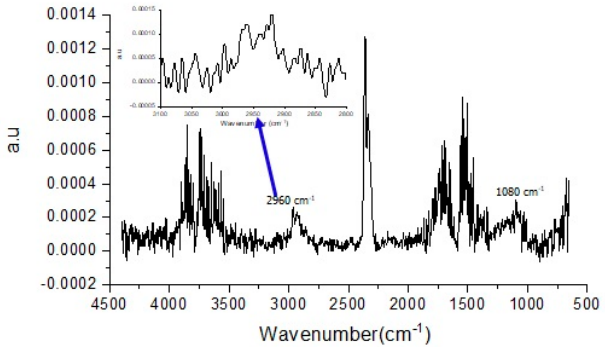

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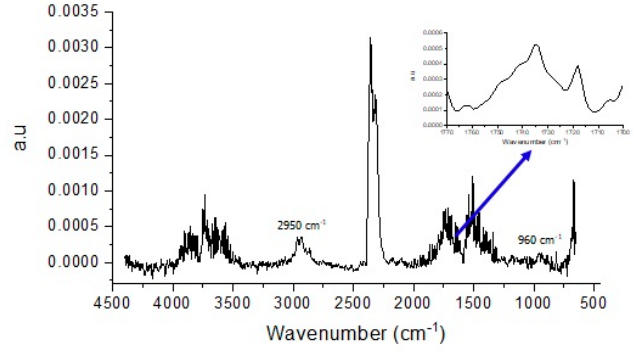

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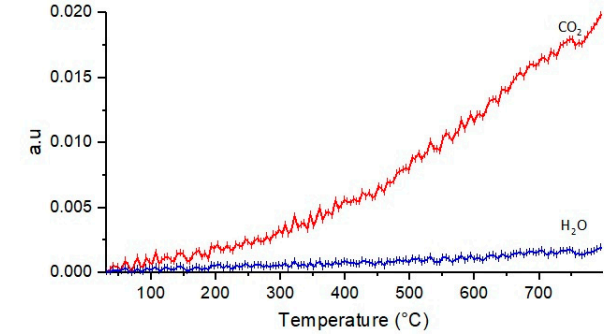


(**d**)

Figure S3. (**a**) Thermal degradation of graphene ethyl maleate (GEM) made with the adding of AIBN (**b**) Gas infrared spectra correlated with the degradation of GEM at 220 °C with (inside caption) the peak observed with the subtraction of water, (**c**) 420 °C with the peak observed with (inside the caption) the subtraction of water and (**d**) the kinetics devolution of CO_2 and H_2O during the heating of the sample.

ADDITIONAL FESEM CHARACTERIZATION

Figure S4 provides additional FESEM images of exfoliated graphene before and after the modification with maleate, confirming the findings discussed in the main manuscript.

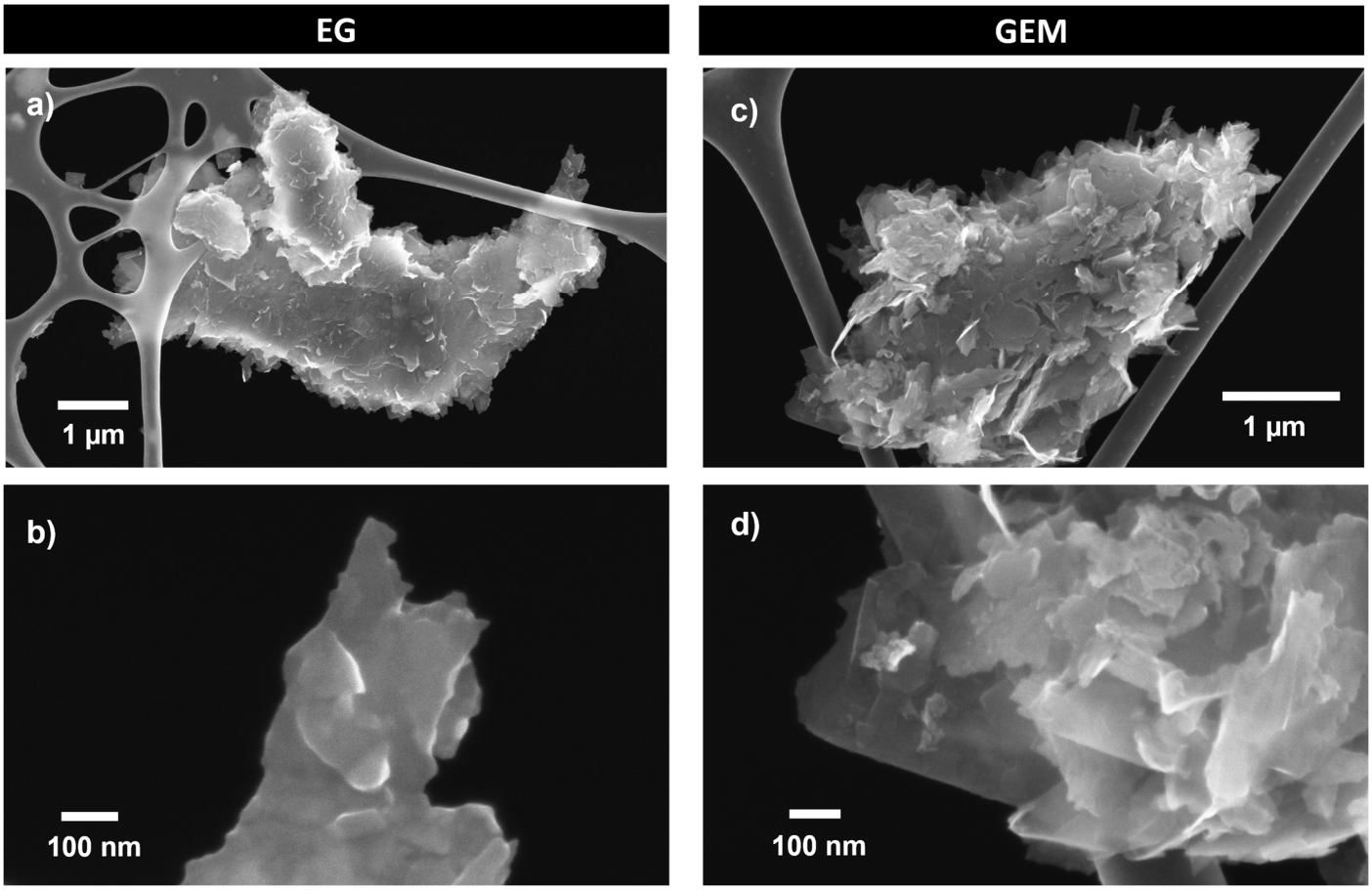
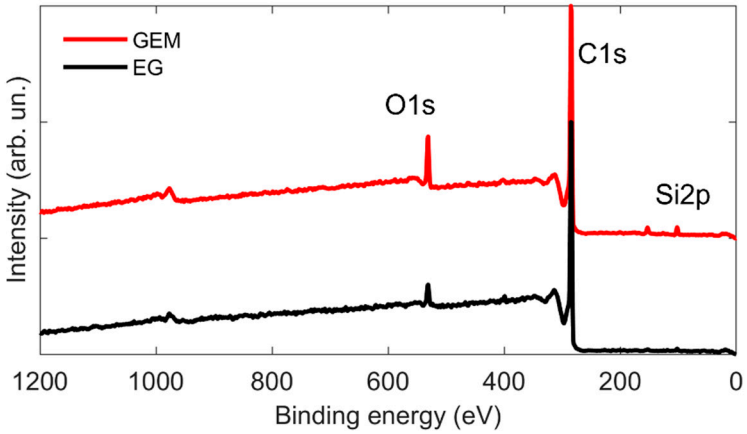


Figure S4. Field-emission Scanning Electron Microscopy images at different magnifications showing exfoliated graphene (EG) (**a**,**b**) and graphene modified with maleate (GEM) (**c**,**d**) on lacey carbon membranes.

ADDITIONAL XPS CHARACTERIZATION

Figure S5 provides XPS survey spectra of exfoliated graphene before and after the modification with maleate. Si-containing contamination is probably due to silicon oil probably present on the lab as vapor contamination.



Sample	C (at%)	O (at%)	Si (at%)
EG	95.4 ± 0.3	4.2 ± 0.3	0.4 ± 0.1
GEM	89.2 ± 0.3	8.8 ± 0.3	2.0 ± 0.1

Figure S5: X-ray Photoelectron spectroscopy survey spectrum for exfoliated graphene and GEM, alongside semi-quantitative analysis, reported in the table. Uncertainties on relative atomic concentrations ware calculated using Monte Carlo routines provided in CasaXPS software.

UV Calibration Curve

The uv was performed on a dispertion of Exfoliated graphene in ethanol with a concentration of $4*10^{-5}$ mg mL^{-1} , $2*10^{-4}$ mg mL^{-1},$4*10^{-4}$ mg mL^{-1}.

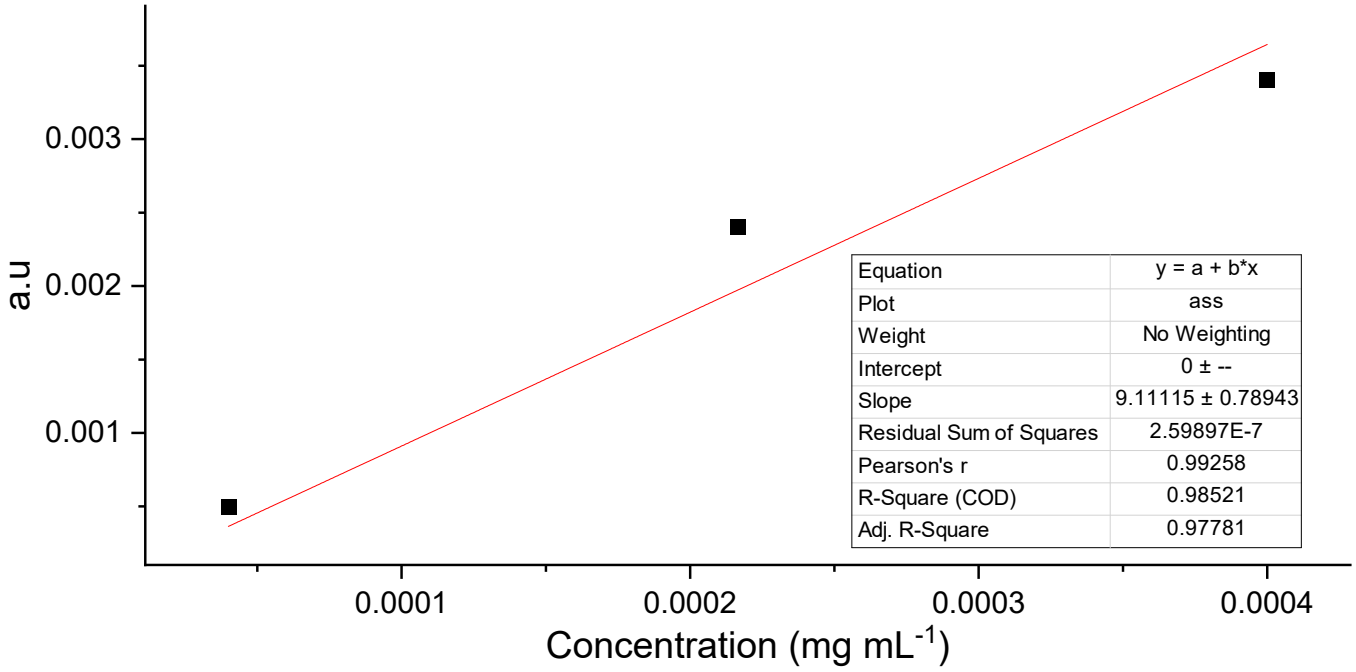


Figure S6. Calibration curve of exfoliated graphene in ethanol.

Table S1 Legend

Name	Abbreviation
Exfoliated Graphene	EG
Graphene diethyl maleate	GEM
Azobisisobutyronitrile	AIBN
n-methyl pirrolidone	NMP
Dimethyl formamide	DMF
Dimethyl sulfoxide	DMSO
Graphene colloidal	GC
Graphene composite Polyvinyl pyrrolidone	G-PVP