Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Tuning the surface chemistry of graphene: new strategies for selective oxidation

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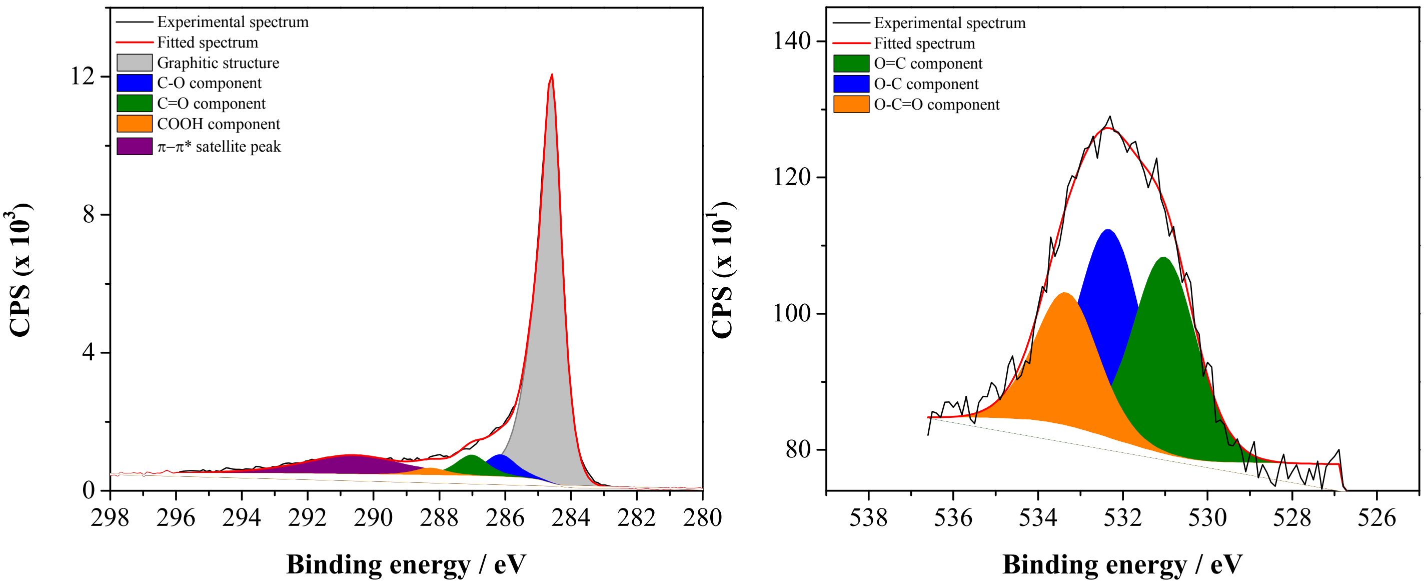
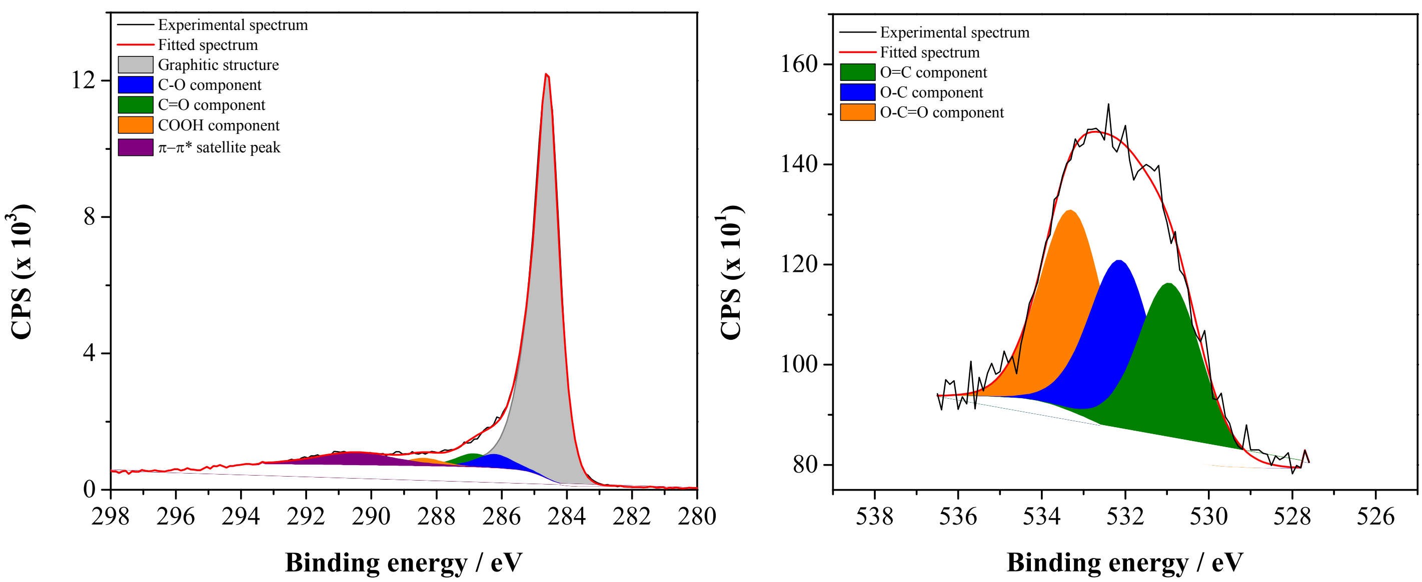
Figure S1. Deconvoluted C1s (on the left) and O1s (on the right) high resolution spectra of a) GF; b) GF_HNO_3; c) GF_m-CPBA_0.1M; d) GF_m-CPBA_0.01M; e) GF_O_3_gas; f) GF_O3_disp.

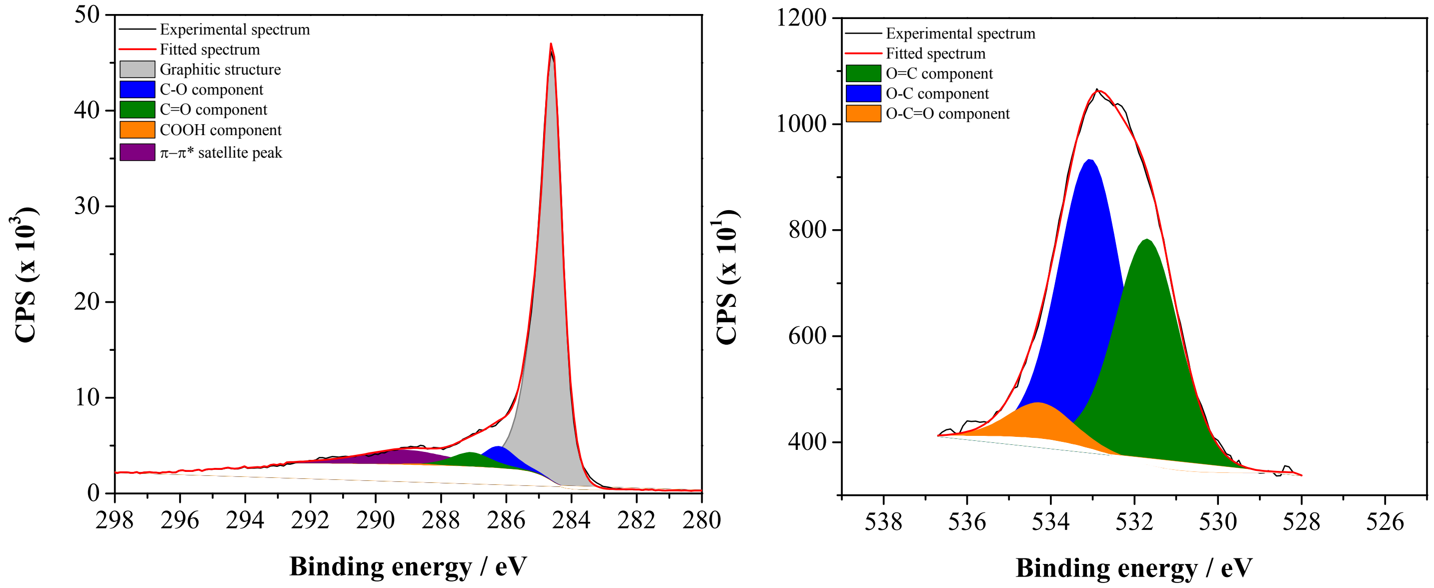
a)

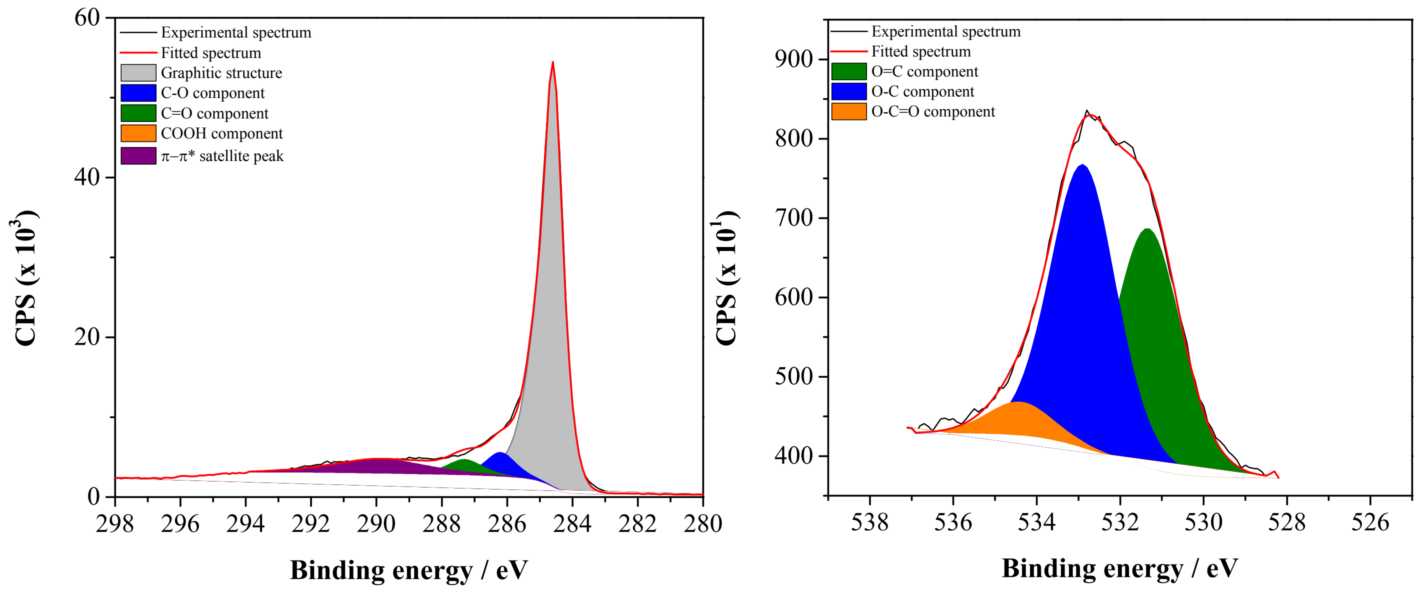


b)



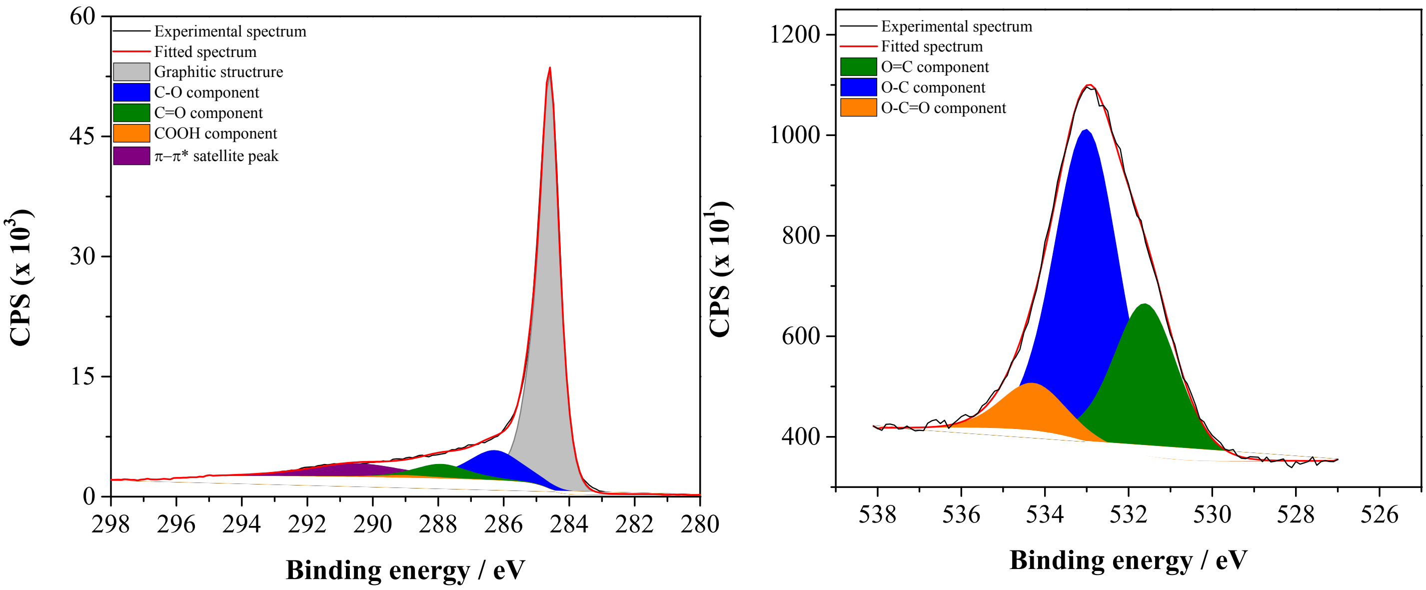
c)

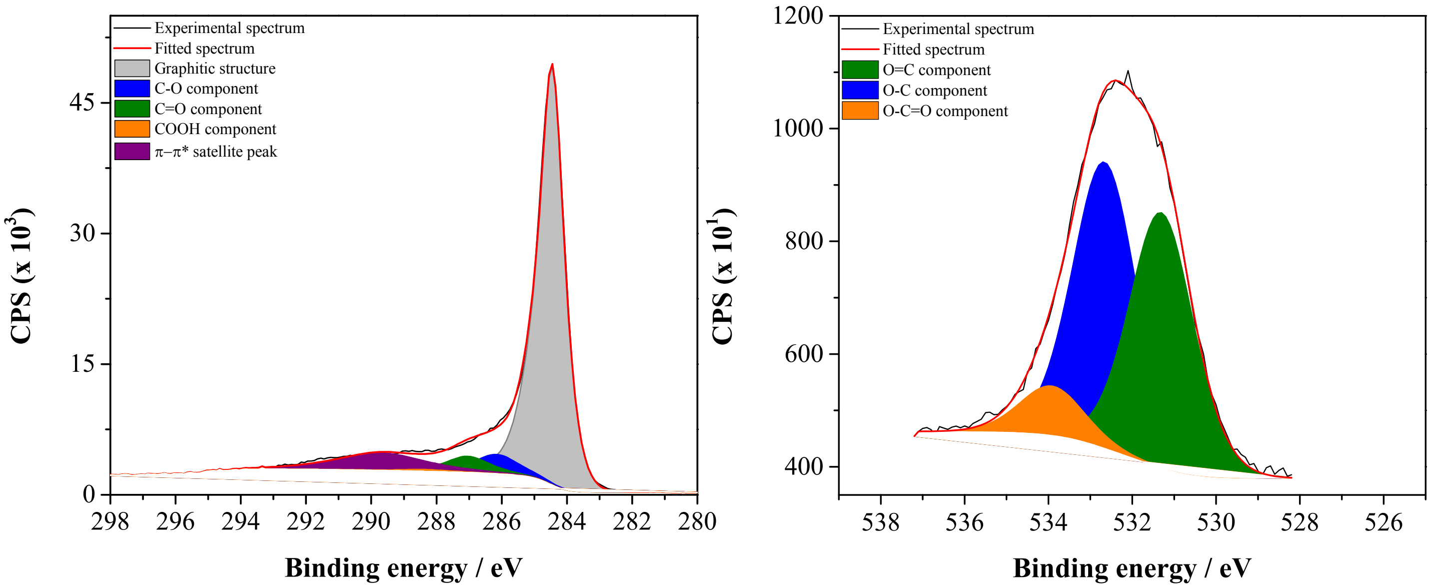

Experimental spectrum
Fitted spectrum
Graphitic structure
C-O component
C=O component
COOH component
π−π* satellite peak
CPS (x 10³)
Binding energy / eV
Experimental spectrum
Fitted spectrum
O=C component
O-C component
O-C=O component
CPS (x 10¹)
Binding energy / eV


Experimental spectrum
Fitted spectrum
Graphitic structure
C-O component
C=O component
COOH component
π−π* satellite peak
CPS (x 10³)
Binding energy / eV
Experimental spectrum
Fitted spectrum
O=C component
O-C component
O-C=O component
CPS (x 10¹)
Binding energy / eV

d)

e)

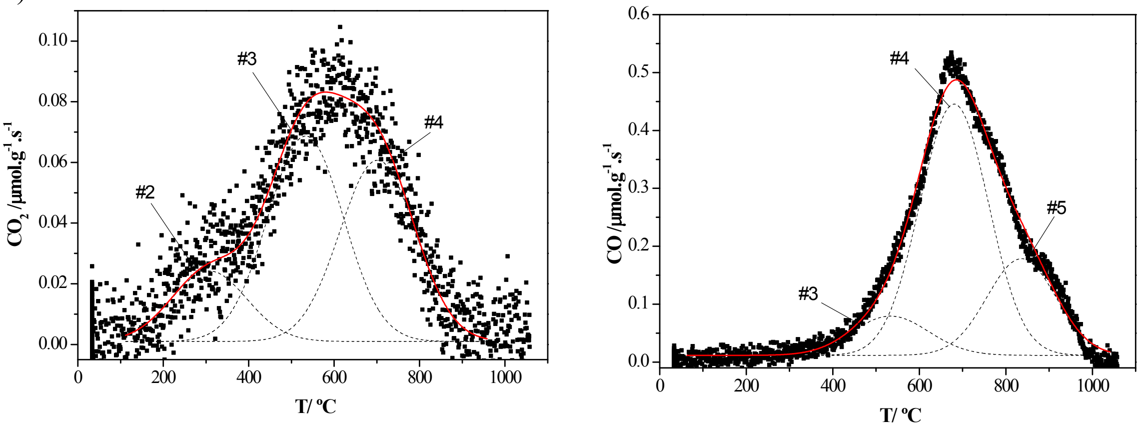

Experimental spectrum
Fitted spectrum
Graphitic structrure
C-O component
C=O component
COOH component
π−π* satellite peak
CPS (x 10^3)
Binding energy / eV
Experimental spectrum
Fitted spectrum
O=C component
O-C component
O-C=O component
CPS (x 10^1)
Binding energy / eV


Experimental spectrum
Fitted spectrum
Graphitic structure
C-O component
C=O component
COOH component
π−π* satellite peak
CPS (x 10^3)
Binding energy / eV
Experimental spectrum
Fitted spectrum
O=C component
O-C component
O-C=O component
CPS (x 10^1)
Binding energy / eV

f)

Figure S2. Deconvoluted CO_2 and CO TPD spectra, using a multiple Gaussian function: a) GF; b) GF_HNO_3; c) GF_m-CPBA; d) GF_$KMnO_4$; e) GF_O_3_gas; f) GF_O_3_disp.

a)



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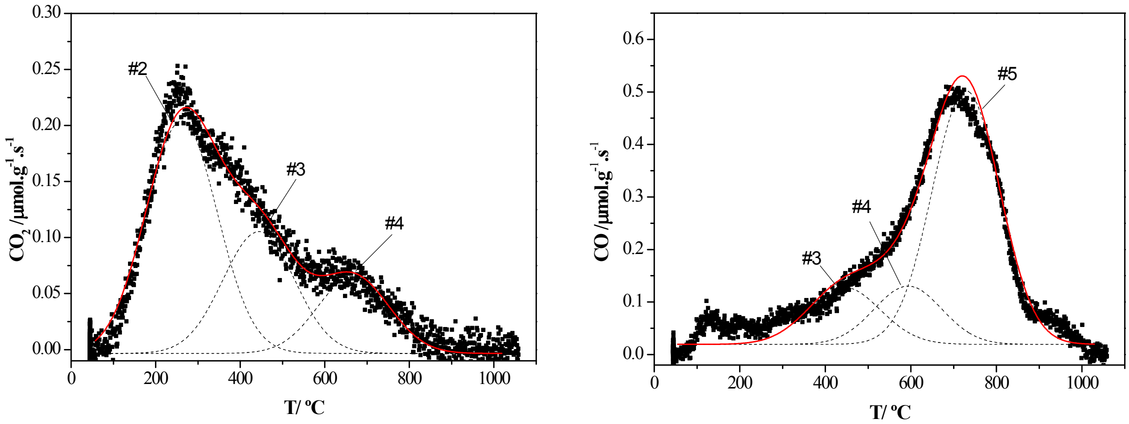
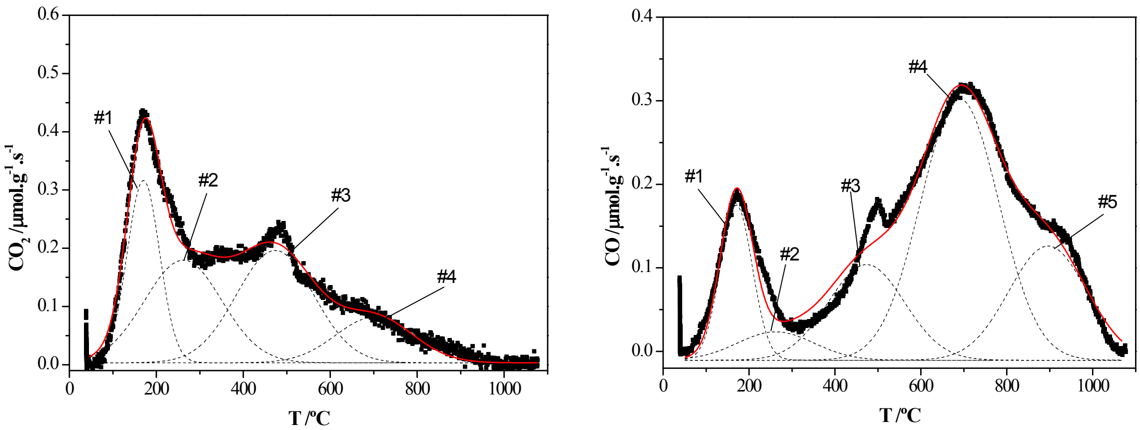
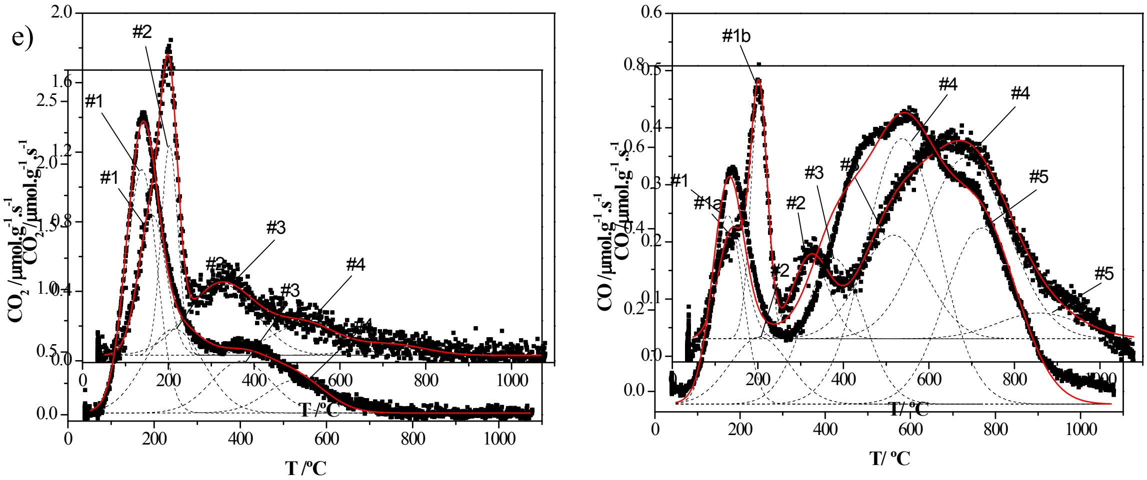


c)



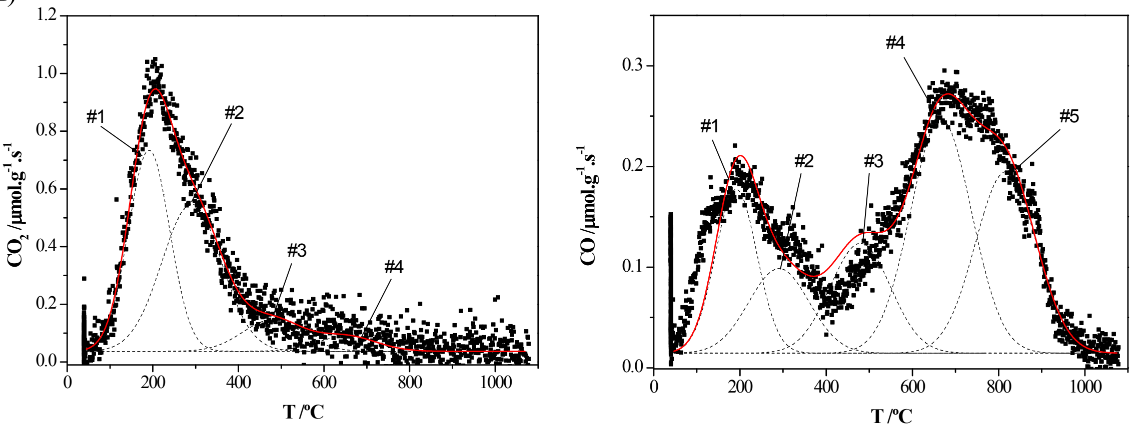
d)

e)



CO_2 /µmol.g^{-1}.s^{-1}
T /ºC
#1
#2
#3
#4
CO /µmol.g^{-1}.s^{-1}
T/ ºC
#1a
#1b
#5

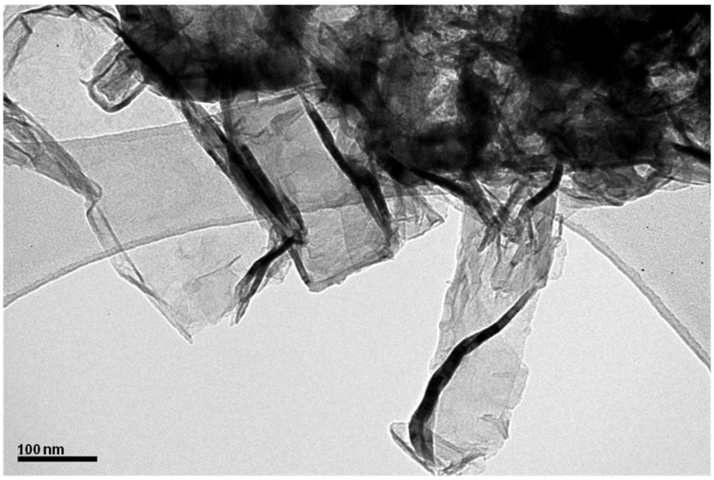
f)



1.2
1.0
0.8
0.6
0.4
0.2
0.0
CO_2 /µmol.g^{-1}.s^{-1}
#1
#2
#3
#4
0
200
400
600
800
1000
T /ºC
0.3
0.2
0.1
0.0
CO /µmol.g^{-1}.s^{-1}
#1
#2
#3
#4
#5
0
200
400
600
800
1000
T /ºC

Figure S3. TEM micrographs of a) GF_m-CPBA and b) GF_O_3_disp; scale bars correspond to 100 nm.

a)



b)

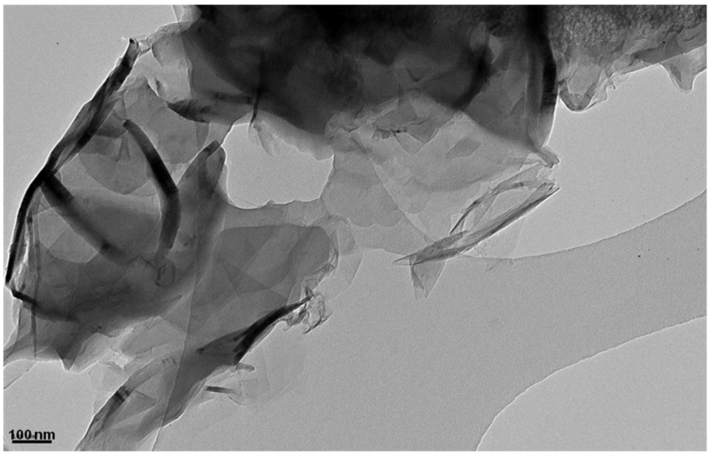


Figure S4. Calculated I_{2D}/I_G ratio for pristine and oxidized graphene flakes.

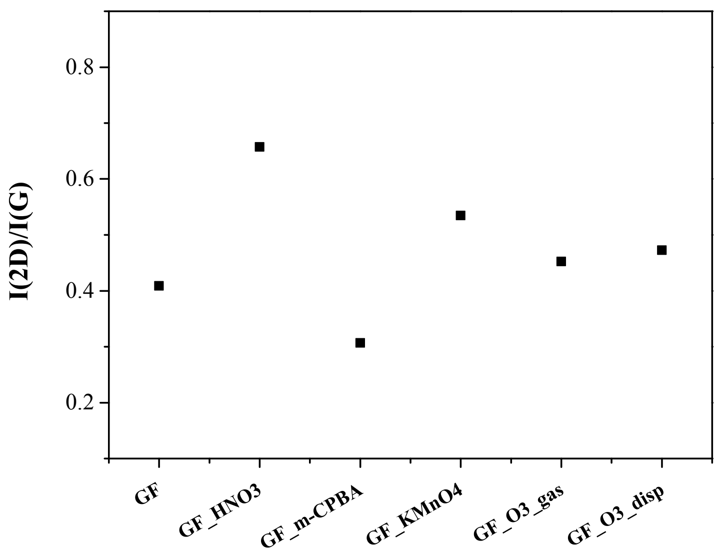


Table S1. Relative atomic percentages of oxygen-based functional groups presented in the XPS high resolution O1s spectra.

Graphene flakes	% O		
	531.3 eV O=C	**532.7 eV O-C**	**533.9 eV OCO**
GF	36.6	38.7	24.7
GF_HNO_3	31.4	31.7	36.9
GF_O_3_disp	43.2	48.5	8.4
GF_O_3_gas	29.6	61.1	9.3
GF_$KMnO_4$	32.7	57.8	9.5
GF_m-CPBA 0.1 M	40.9	52.6	6.5
GF_m-CPBA 0.01 M	43.0	51.0	6.0