Electronic Supplementary Information for:

Solvent-free Diels-Alder reaction of graphite into functionalized graphene nanosheets

Jeong-Min Seo and Jong-Beom Baek[a]

[a] School of Energy and Chemical Engineering/Low-Dimensional Carbon Materials Center, Ulsan National Institute of Science and Technology (UNIST), UNIST-gil 50, Ulsan, 689-798, South Korea

E-mail: jbbaek@unist.ac.kr

Materials

Graphite (99.9% purity, stock no. 1250HT, CAS no. 7782-42-5, Lot no. 1250-100907) was obtained from Nanostructured & Amorphous Materials Inc., USA, and used as received. Maleic anhydride (FW = 98.06) and maleimide (FW = 97.07) were purchased from Sigma Aldrich Chemical Inc. and used as received.

Solvent-free Diels-Alder reaction of MAG and MIG

A mixture of pristine graphite (0.5 g) and maleic anhydride (5 g, 50.98 mmol) or maleimide (5 g, 51.50 mmol) were placed into a glass ampoule. After removing residual air through several vacuum purging/argon refill cycles, the reagents are sealed and allowed to react at 220 ^{o}C (MAG) or 160 ^{o}C (MIG) for 12 h. Thereafter the resultant products were Soxhlet extracted with tetrahydrofuran (THF) for 24 h and freeze-dried at 120 ^{o}C under a reduced pressure (0.5 mmHg) for 72 h to give 0.502 g of MAG and 0.501 g of MIG as a dark-black powder.

Instrumentation.

The morphology of the samples was examined by field-emission scanning electron microscopy (FE-SEM, FEI Nanonova 230) while high-resolution transmission electron microscopy (HR-TEM) was carried out on a JEOL JEM-2100F microscope operating at 200 kV. Themogravimetric analysis (TGA) was conducted on a TA Q600 (TA Instrument) under air at a heating rate of 10 °C min^{-1}. Raman spectra were recorded using an Alpha 300S confocal Raman spectrometer (WITec, Germany) with a 532 nm He–Ne laser. Fourier transform infrared (FT-IR) spectra were recorded on a Perkin-Elmer Spectrum 100 using KBr pellets. X-ray photoelectron spectra (XPS) were recorded on a Thermo Fisher K-alpha XPS spectrometer.

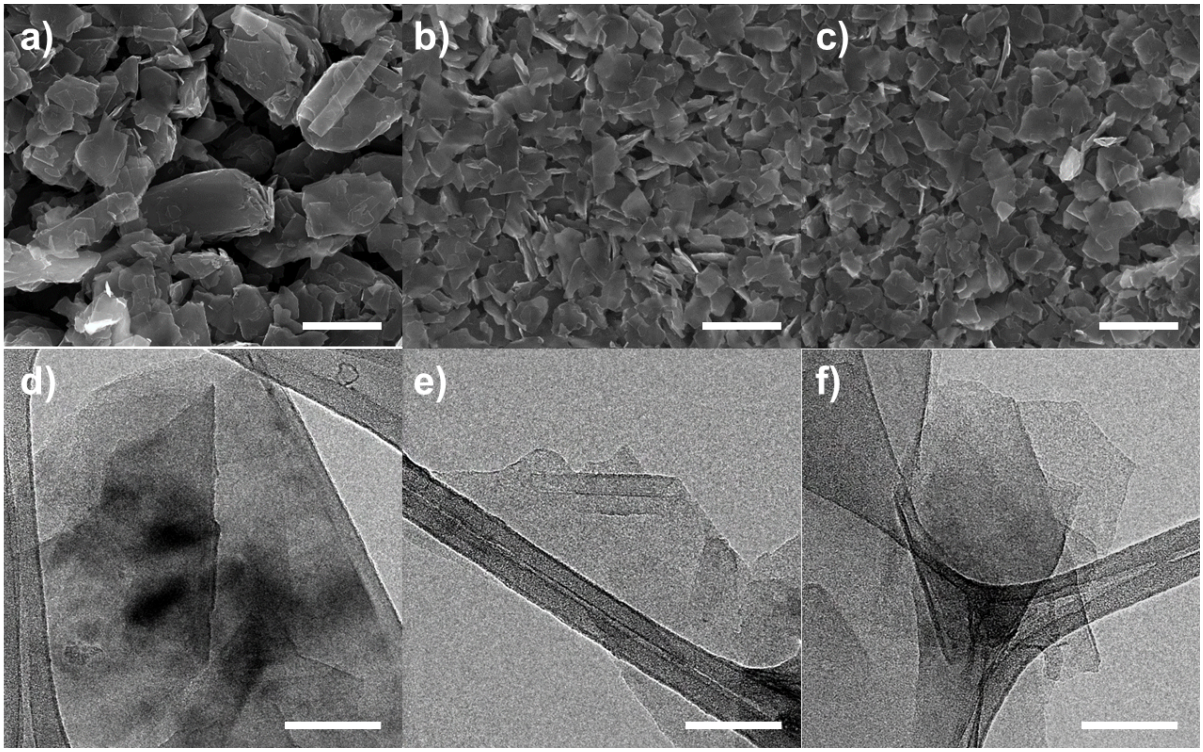

Figure S1. Low-magnification SEM image: a) pristine graphite, b) MAG, and c) MIG. Scale bars are 2 μm. Low-magnification HR-TEM images: d) pristine graphite, e) MAG, and f) MIG. Scale bars are 100 nm.

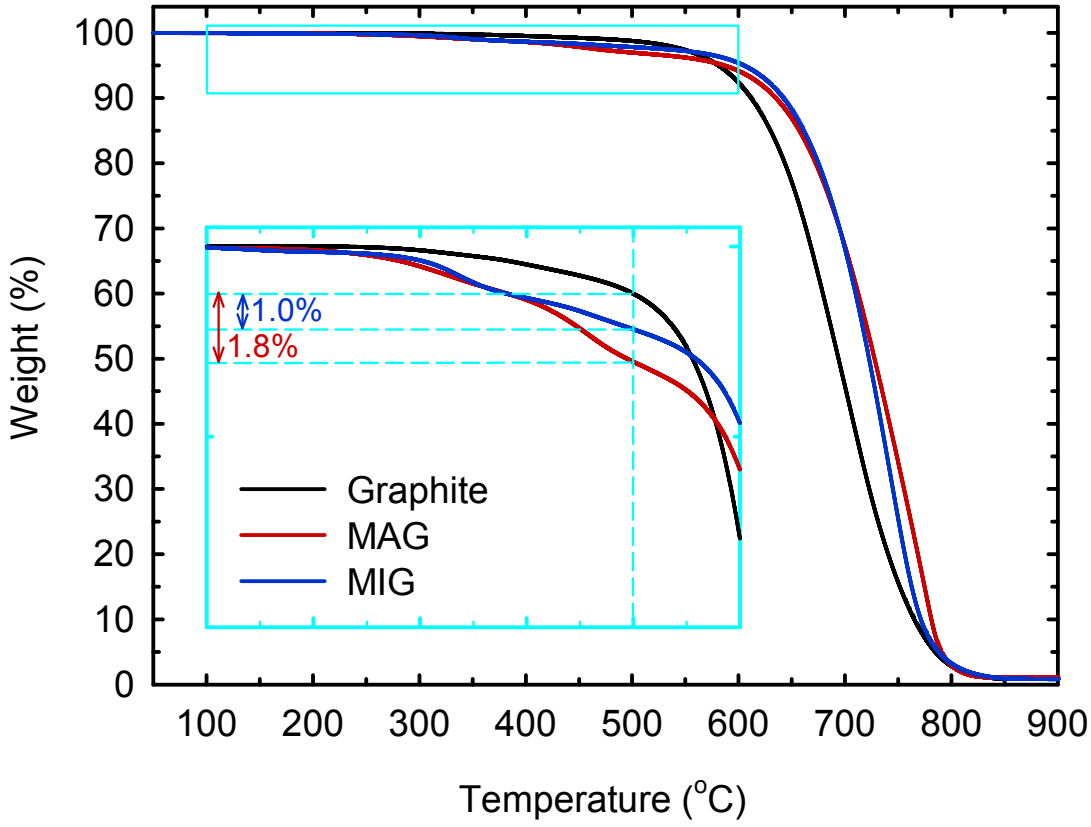

Figure S2. TGA thermograms obtained from the heating rate of 10 ^{o}C min^{-1} in air.

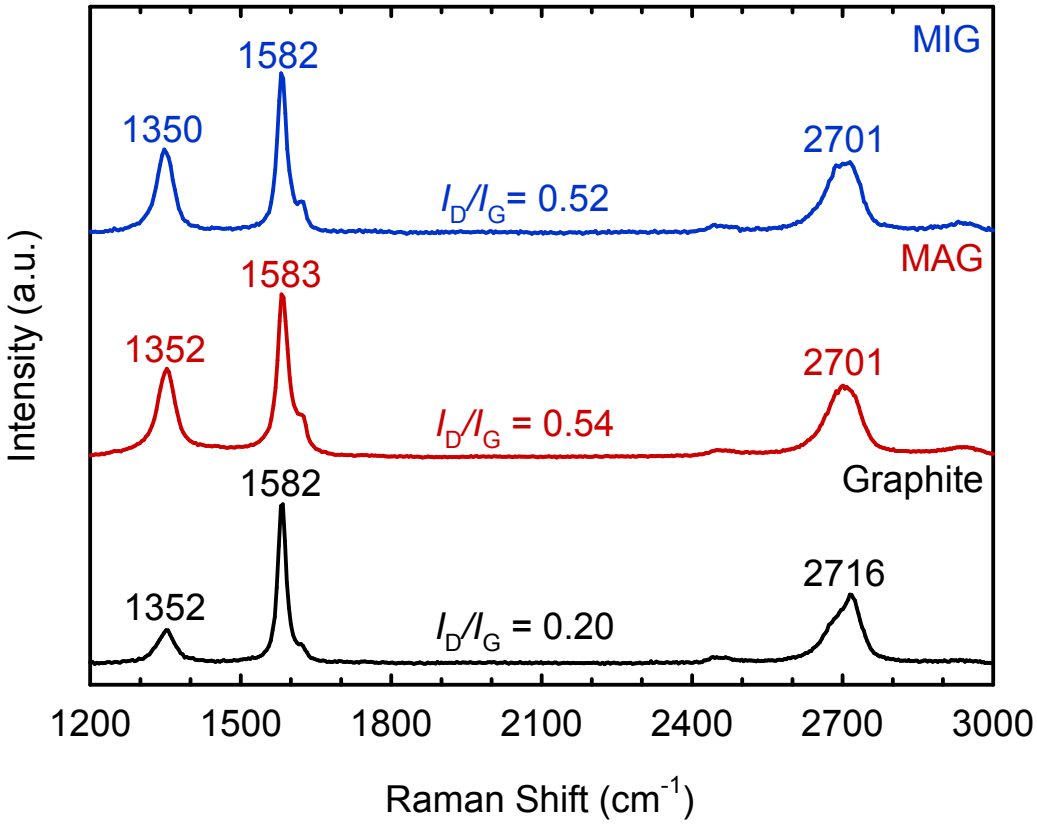

Figure S3. Raman spectra obtained by a focused laser.

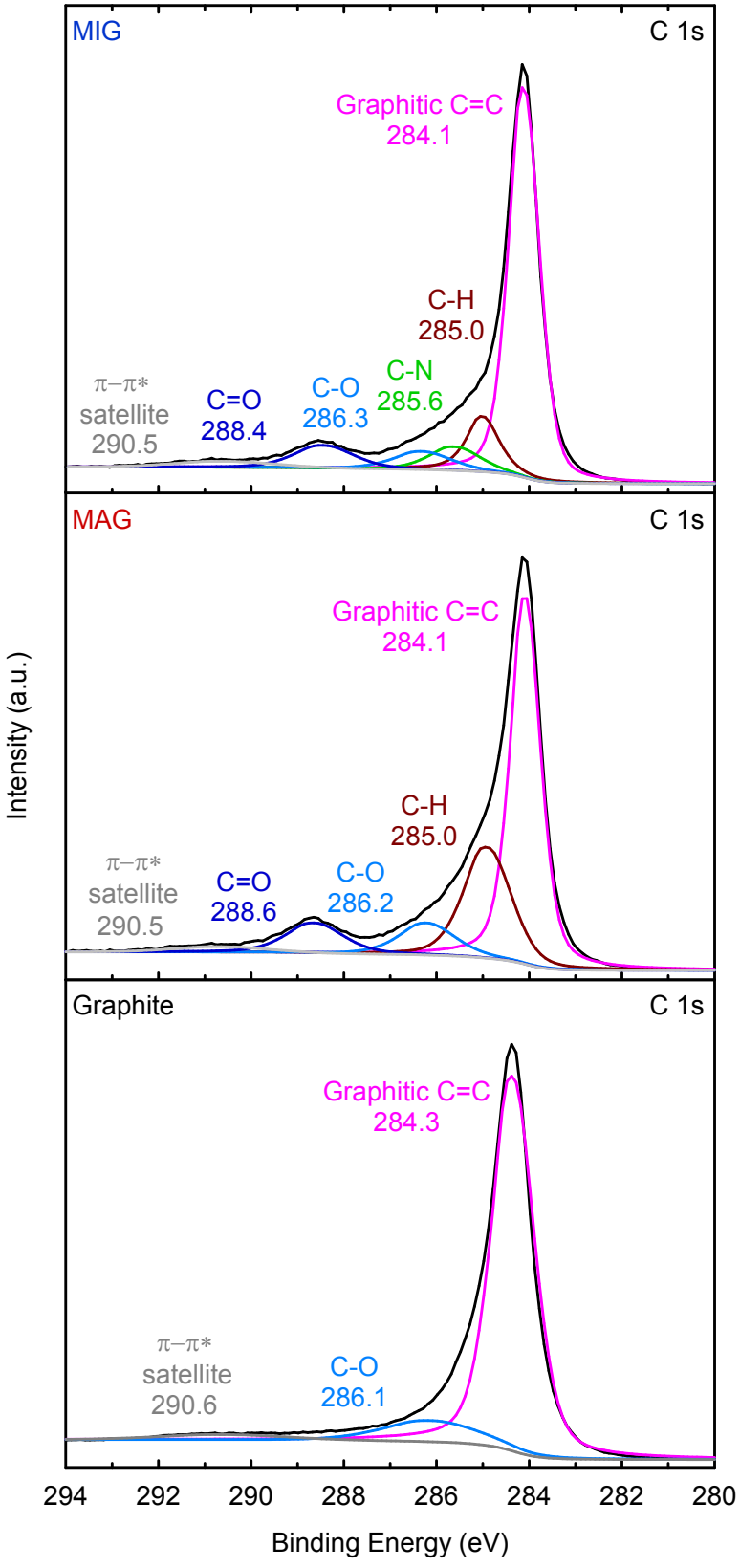

Figure S4. High resolution XPS spectra of the C 1s regions.

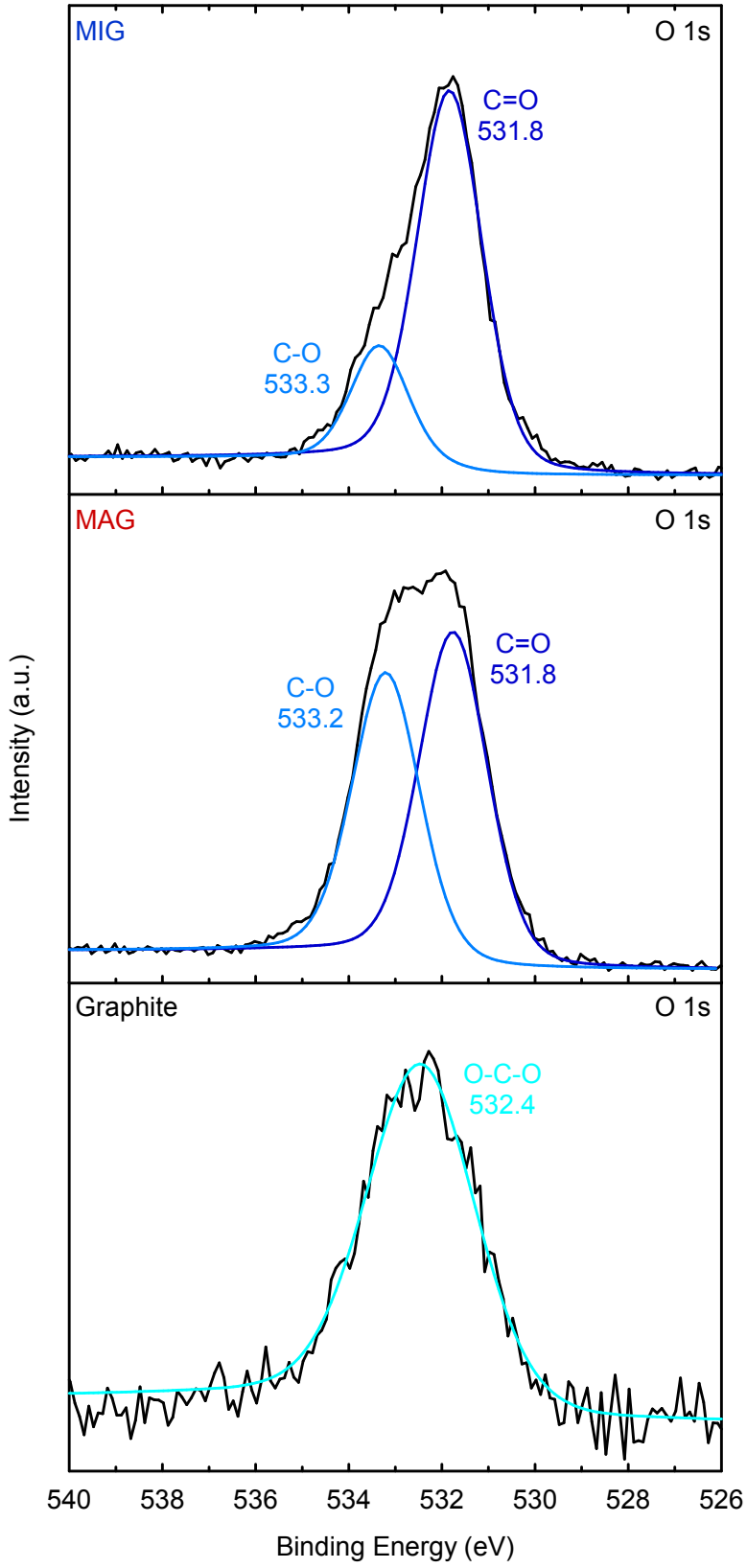

Figure S5. High resolution XPS spectra of the O 1s regions.

Table S1. XPS elemental composition of pristine graphite, MAG and MIG

	C (at.%)	O (at.%)	N (at.%)	C/O	C/N	Total
Graphite	98.16	1.84	NA[a]	53.35	NA	100
MAG	88.16	11.84	NA	7.45	NA	100
MIG	90.96	6.98	2.05	13.03	44.37	100

[a]NA: Not applicable