Electronic Supplementary Information of

Importance of Open, Heteroatom-Decorated Edges in Chemically-Doped-Graphenes for Supercapacitor Applications

Kazunori Fujisawa[1], Rodolfo Cruz-Silva[2], Kap-Seung Yang[3], Takuya Hayashi[1], Yoong Ahm Kim[3,*]Morinobu Endo[2], Mauricio Terrones[2, 4], Mildred S. Dresselhaus[5]

[1]*Faculty of Engineering, Shinshu University, 4-17-1 Wakasato, Nagano 380-8553, Japan.*

[2]*Research Center for Exotic Nanocarbons (JST), Shinshu University, 4-17-1 Wakasato, Nagano 380-8553, Japan.*

[3]*School of Polymer Science and Engineering & Alan G. MacDiarmid Energy Research Institute, Chonnam National University, 77 Yongbong-ro, Buk-gu, Gwangju 500-757, Korea.*

[4]*Departments of Physics and of Materials Science and Engineering and Materials Research Institute, The Pennsylvania State University, 104 Davey Lab, University Park, Pennsylvania 16802-6300, USA.*

[5]*Massachusetts Institute of Technology, Cambridge, Massachusetts 02139-4307, USA*

* Corresponding author: yak@jnu.ac.kr Tel: +82-62-530-1871

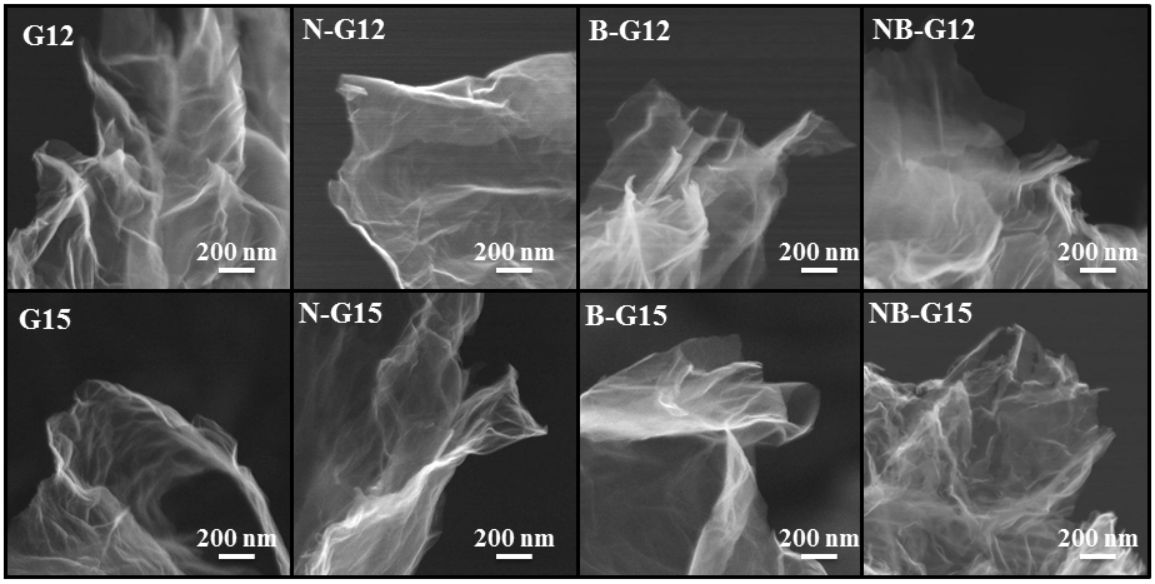

Figure S1 FE-SEM images of undoped and heteroatom-doped graphenes. All graphene samp les show a flat and sheet-like structure.

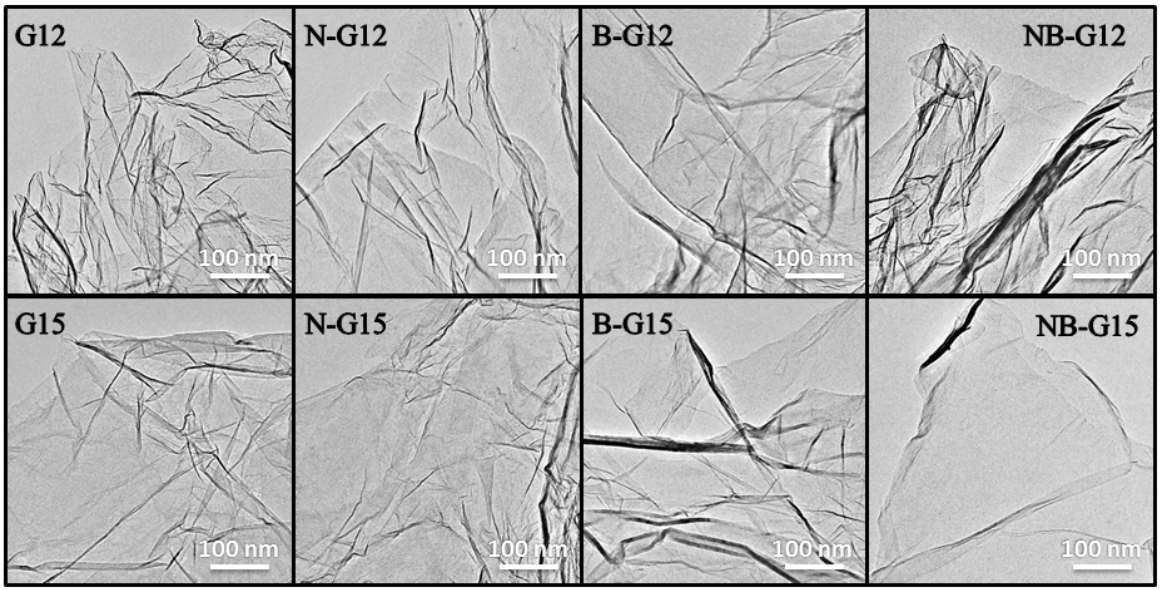

Figure S2 Low magnification HR-TEM image of un-doped and doped graphenes. Both un-d oped and doped graphenes show, bended, rippled and highly disordered structures. Note that no impurities were observed.

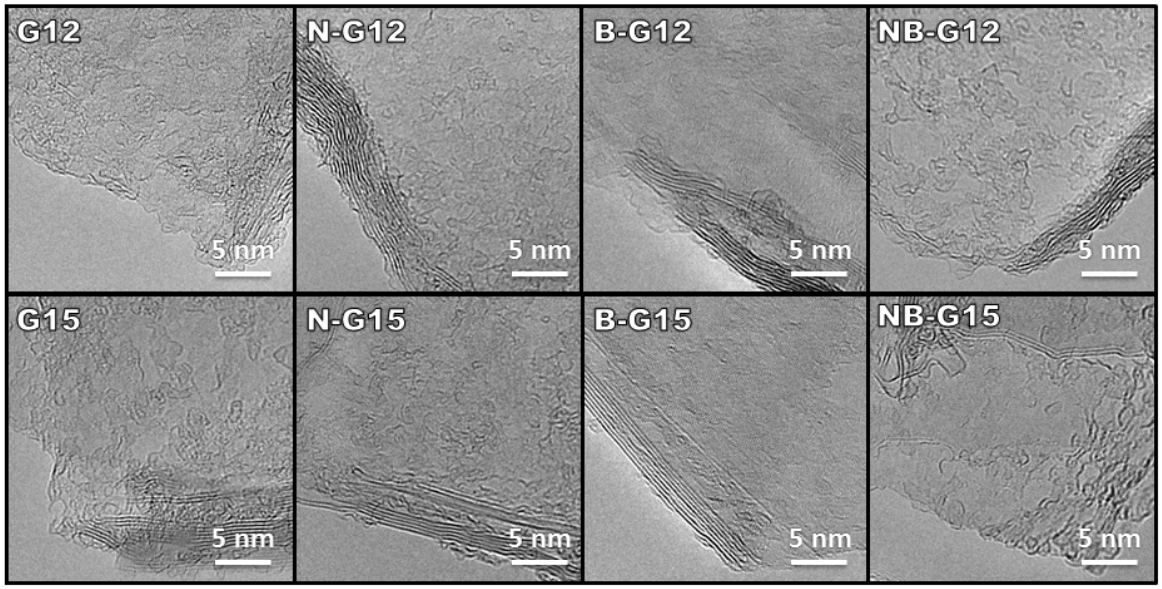

Figure S3 High magnification HR-TEM image of un-doped and doped graphenes. Graphenes are partly multi-layered and the number of layers was estimated to be around 5-9.

Table S1 *R* value and FWHM of the D-band for undoped and doped graphenes, evaluated from Raman spectra.

Sample I.D.	HTT (°C)	Dopant	*R* value (I_D/I_G)[a]	FWHM (D-band) (cm^{-1})
G12	1200	-	1.38	85.8
B-G12		B	1.25	97.5
N-G12		N	1.22	103
NB-G12		N-B	1.03	93.0
G15	1500	-	0.99	93.7
B-G15		B	0.89	73.9
N-G15		N	1.11	82.6
NB-G15		N-B	1.07	72.7

[a] The *R* value (I_D/I_G) is the integrated intensity of the D band divided by the integrated intensity of the G band.

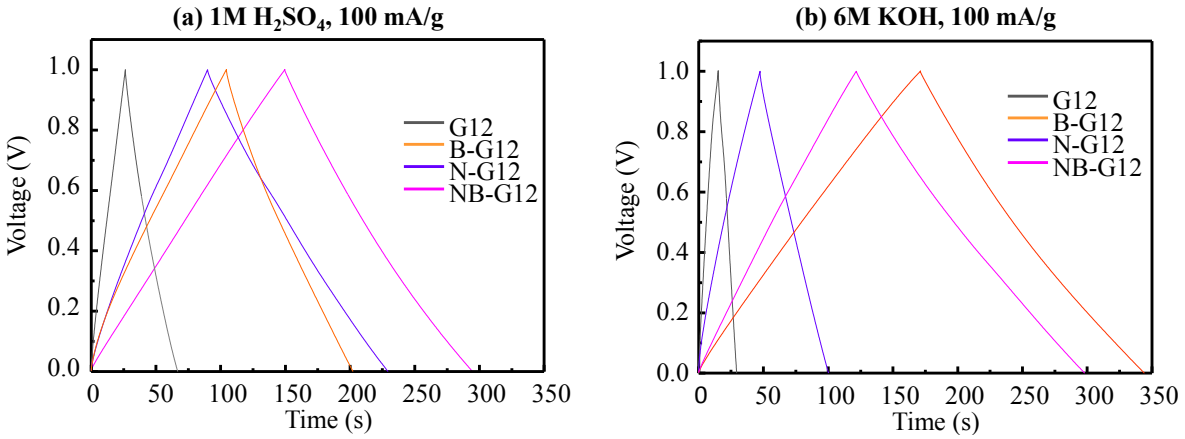

Figure S4 Galvanostatic charge/discharge curves of un-doped and doped graphenes in (a) 1M H_2SO_4 and (b) 6M KOH. Note that the current density is 100mA/g.

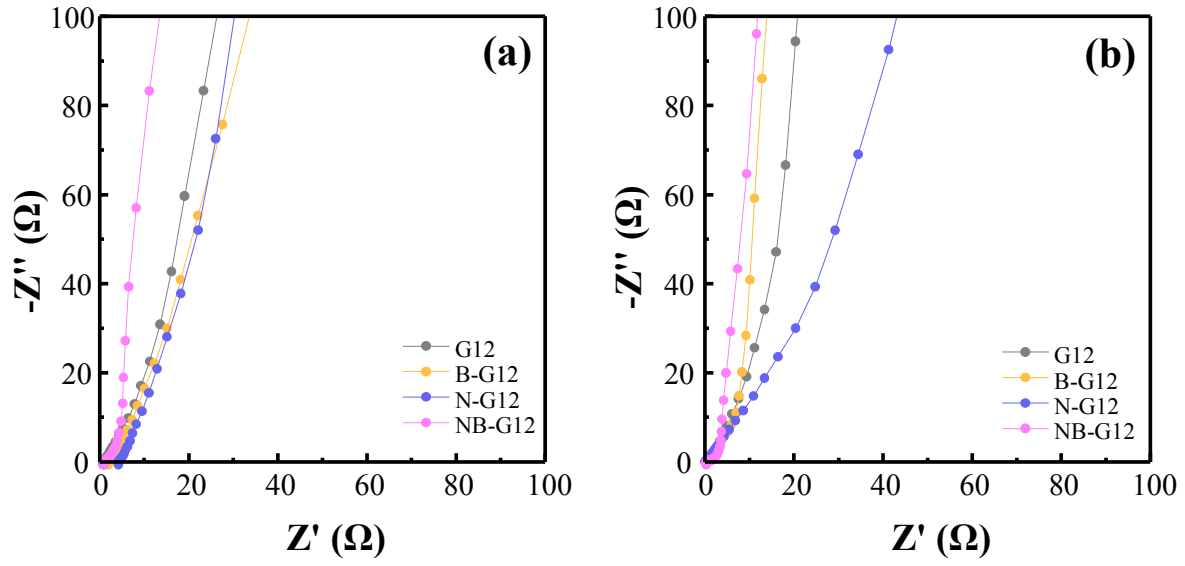

Figure S5 Electrochemical Impedance spectroscopy results of un-doped and doped graphene in (a) 1M H_2SO_4 and (b) 6M KOH.