## *Supporting Information*

# Honeycomb-like Porous Carbon with Nano-graphitic Domains, Supported on Graphene Layers: Applicability for Lithium/Sodium Storage

Li Su[†,‡], Lina Kong[‡], Shuaiguo Hao[‡], Yao Zhao[‡], Zhipeng Ma[‡], Xiujuan Qin[**,†,‡], Guangjie Shao[*,†,‡]

† State Key Laboratory of Metastable Materials Science and Technology, Yanshan University, Qinhuangdao 066004, China

‡ Hebei Key Laboratory of Applied Chemistry, College of Environmental and Chemical Engineering, Yanshan University, Qinhuangdao 066004, China

*Corresponding author at: College of Environmental and Chemical Engineering, Yanshan University, Qinhuangdao 066004, China

**Corresponding author at: College of Environmental and Chemical Engineering, Yanshan University, Qinhuangdao 066004, China

E-mail address: shaoguangjie@ysu.edu.cn (G. Shao), qinxj@ysu.edu.cn (X. Qin)

Tel.: 0086-335-8061569; Fax: 0086-335-8059878.

**Figure S1** (a-f) TEM images of GO, GFe0, GFe5, GFe20, GFe30, and GFe35, respectively.

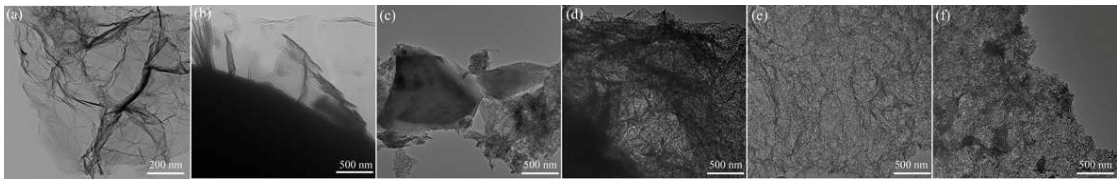

**Figure S2** XRD of precursor.

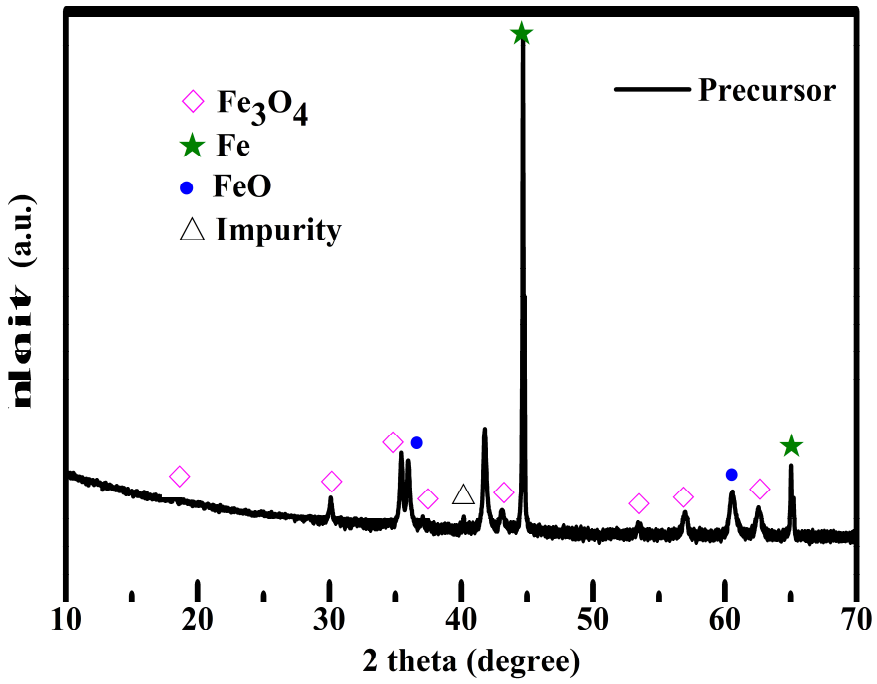

**Figure S3** XRD patterns of GFe0, GFe5, GFe20, GFe30, and GFe35, respectively.

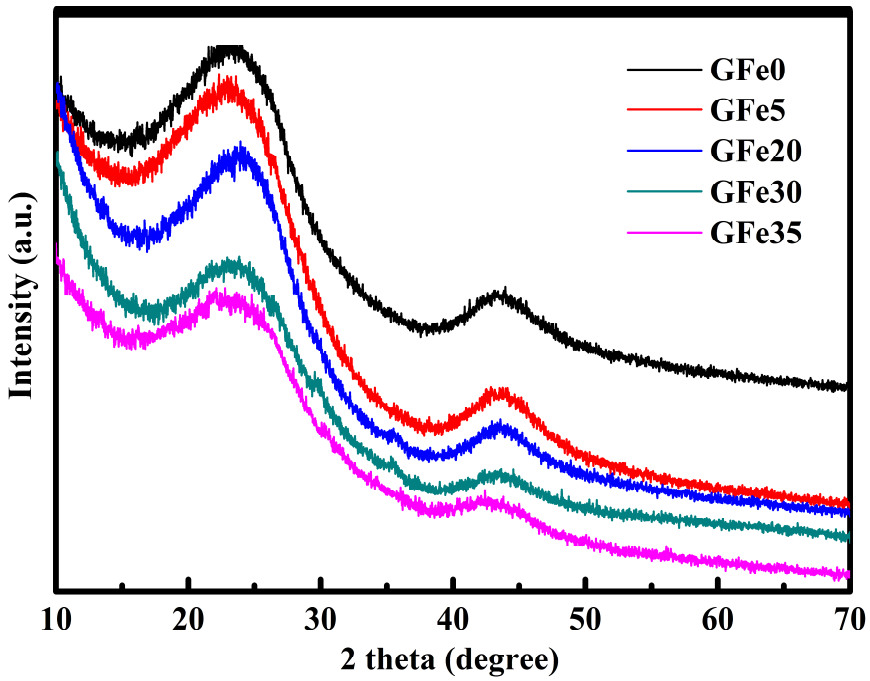

**Figure S4** Raman spectra of GFe0, GFe5, GFe20, GFe30, and GFe35, respectively.

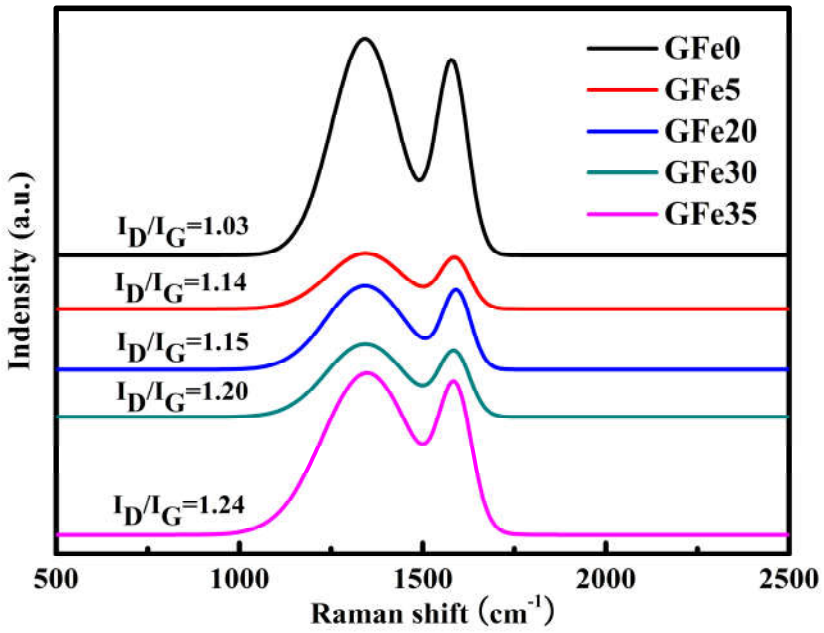

**Figure S5** Cycling performance of GFe5, GFe20, and GFe35 at current densities of 1.0 A $g^{-1}$.

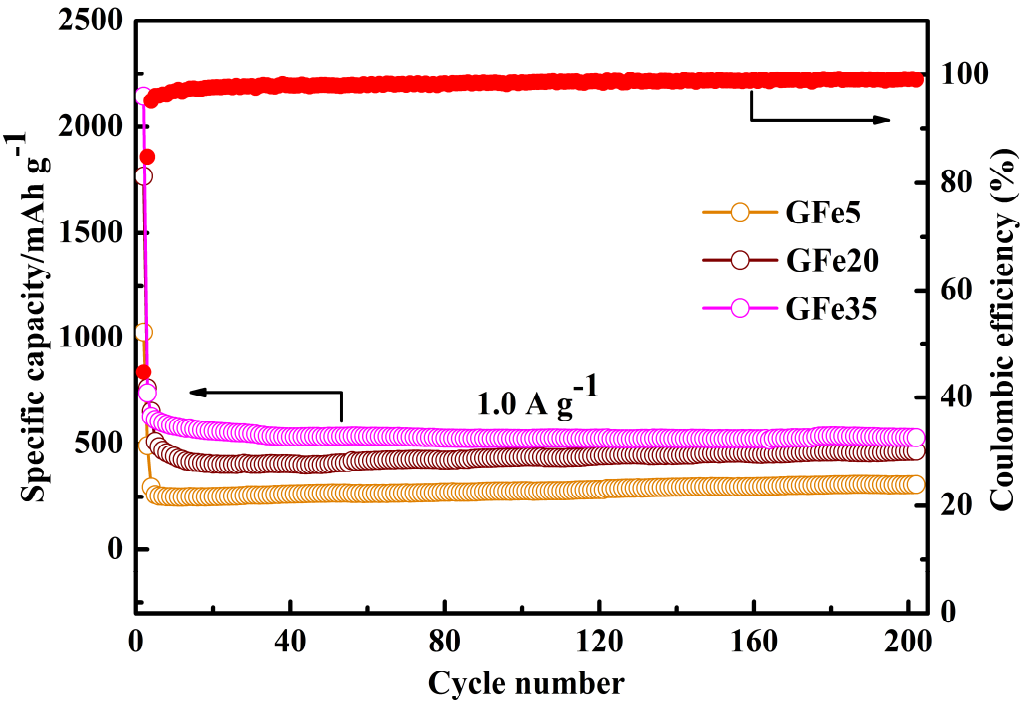

**Figure S6** The electrochemical impedance spectroscopy of GFe0, Fe30, and GFe30.

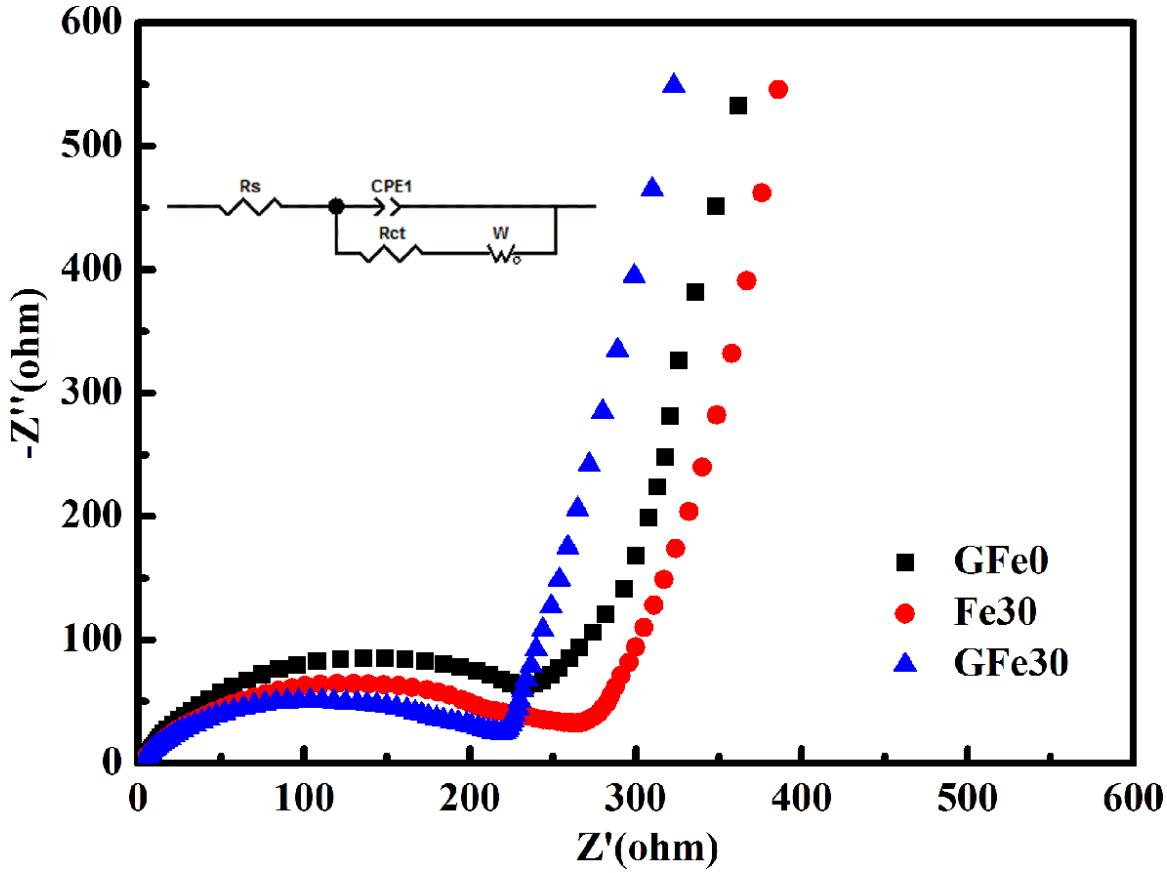

**Figure S7** The SEM morphology of cycled electrode material for LIBs.

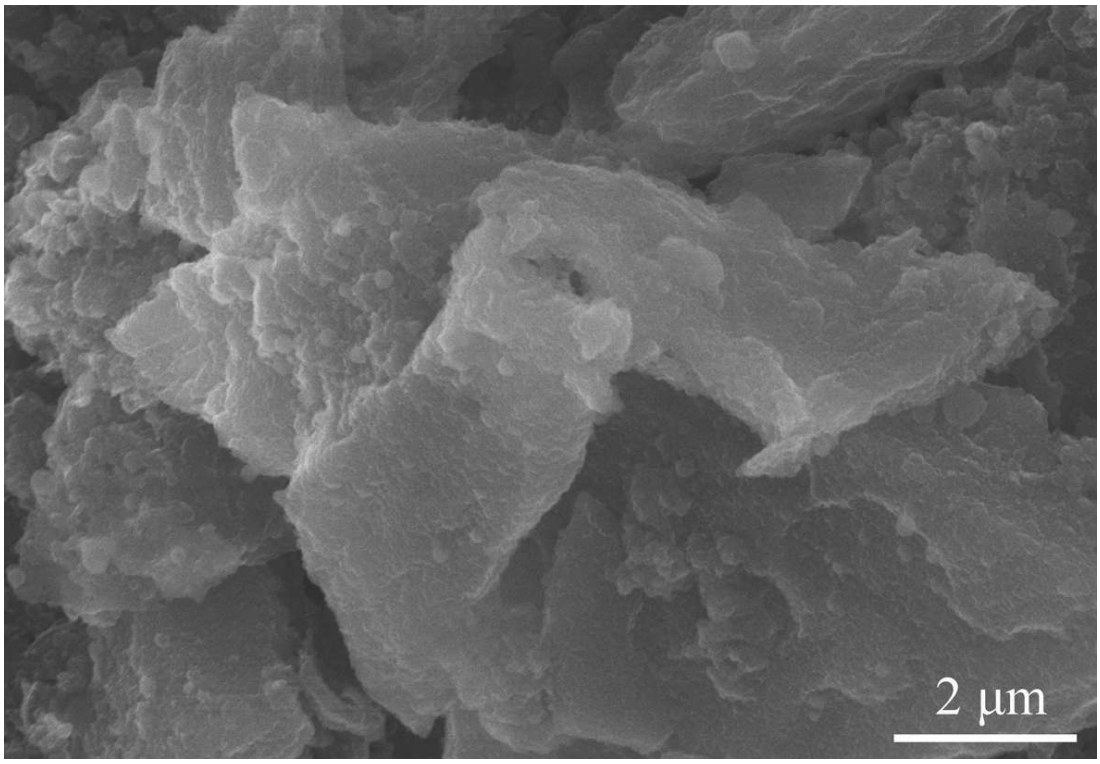

**Figure S8** The SEM morphology of cycled electrode material for SIBs.

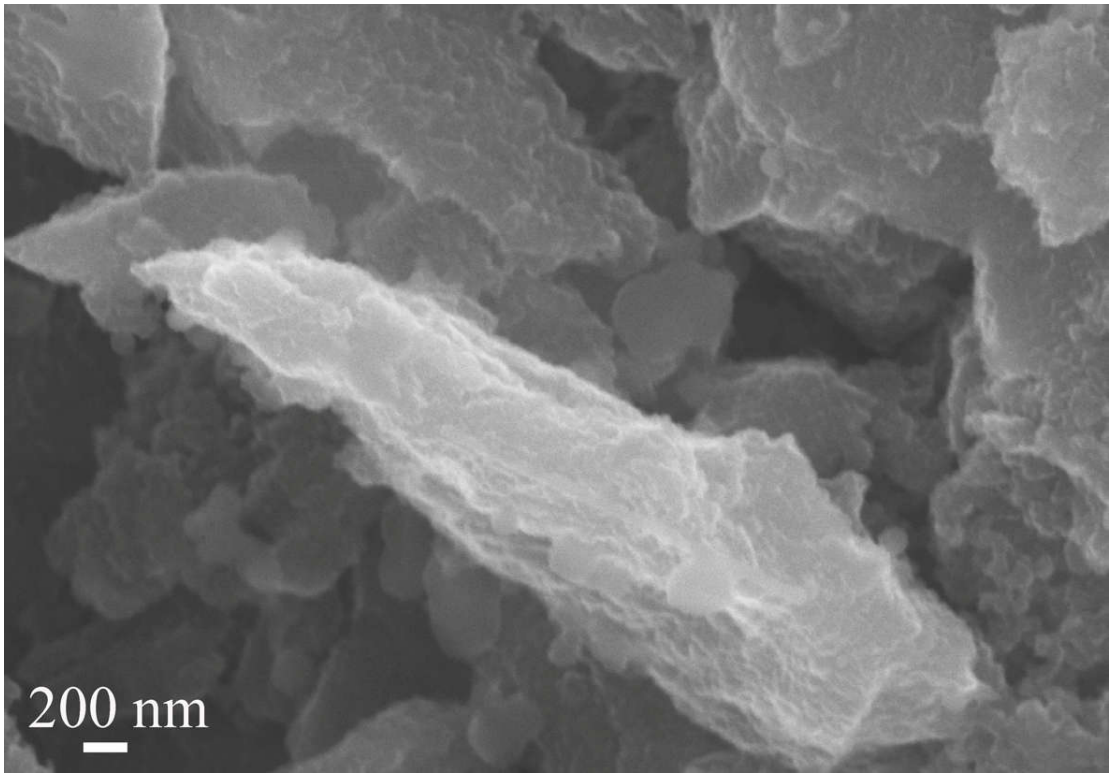

**Table S1** Comparisons of electrochemical performance of different carbon materials as anodes for LIBs.

| Carbon materials | Reversible capacity ($mAh\ g^{-1}$) | Current density ($A\ g^{-1}$) | Reference |
|---|---|---|---|
| Highly graphitic carbon nanosheets (HGCNs) | 502 | 0.1 C | [1] |
| Hierarchical porous graphitic carbon microbubbles (HPGCMBs) | 1056 | 0.1 | [2] |
| Nitrogen-doped porous carbon scaffolds (NPCSs) | 849 | 0.074 | [3] |
| Toast-like porous carbon (TPC) | 846 | 0.2 | [4] |
| Go-GPCs | 950 | 0.2 | [5] |
| N-doped HC nanoshells (N-GCNs) | 1253 | 0.1 | [6] |
| GFe30 | 1390 | 0.2 | This work |

**Table S2** Comparisons of electrochemical performance of different carbon materials as anodes for SIBs.

| Carbon materials | Reversible capacity ($mAh\ g^{-1}$) | Current density ($A\ g^{-1}$) | Reference |
|---|---|---|---|
| Expanded graphite | 284 | 0.02 | [7] |
| Carbon nanoparticles (CNPs) | 278 | 0.1 | [8] |
| Nitrogen-doped porous carbon scaffolds (NPCSs) | 260 | 0.1 | [3] |
| Nitrogen-doped carbon sandwich nanosheets (G-NCs) | 329 | 0.05 | [9] |
| Nitrogen-doped porous carbon materials (NPC) | 239 | 0.05 | [10] |
| Electrospun carbon nanofibers | 233 | 0.05 | [11] |
| GFe30 | 281 | 0.1 | This work |

REFERENCES

1. Zhou, X.; Chen, F.; Bai, T.; Long, B.; Liao, Q.; Ren, Y.; Yang, J., Interconnected highly graphitic carbon nanosheets derived from wheat stalk as high performance anode materials for lithium ion batteries. *Green Chemistry* **2016,** *18* (7), 2078-2088, DOI 10.1039/C5GC02122G.

2. Song, H.; Yang, G.; Wang, C., General Scalable Strategy toward Heterogeneously Doped Hierarchical Porous Graphitic Carbon Bubbles for Lithium-Ion Battery Anodes. *ACS Appl. Mater. Interfaces* **2014,** *6* (23), 21661-21668, DOI 10.1021/am506747z.

3. Lu, H.; Chen, R.; Hu, Y.; Wang, X.; Wang, Y.; Ma, L.; Zhu, G.; Chen, T.; Tie, Z.; Jin, Z., Bottom-up synthesis of nitrogen-doped porous carbon scaffolds for lithium and sodium storage. *Nanoscale* **2017,** *9* (5), 1972-1977, DOI 10.1039/C6NR08296C.

4. Huang, H.; Cheng, C.; Liang, S.; Liang, C.; Xia, Y.; Gan, Y.; Zhang, J.; Tao, X.; Zhang, W., Toast-like porous carbon derived from one-step reduction of $CaCO_3$ for electrochemical lithium storage. *Carbon* **2018,** *130*, 559-565, DOI 10.1016/j.carbon.2018.01.054.

5. Yang, W.; Yang, W.; Zhang, F.; Wang, G.; Shao, G., Hierarchical Interconnected Expanded Graphitic Ribbons Embedded with Amorphous Carbon: An Advanced Carbon Nanostructure for Superior Lithium and Sodium Storage. *Small* **2018,** *14* (39), 1802221, DOI 10.1002/smll.201802221.

6. Huang, S.; Li, Z.; Wang, B.; Zhang, J.; Peng, Z.; Qi, R.; Wang, J.; Zhao, Y., N-Doping and Defective Nanographitic Domain Coupled Hard Carbon Nanoshells for

High Performance Lithium/Sodium Storage. *Adv. Funct. Mater.* **2018,** *28* (10), 1706294, DOI 10.1002/adfm.201706294.

7. Wen, Y.; He, K.; Zhu, Y.; Han, F.; Xu, Y.; Matsuda, I.; Ishii, Y.; Cumings, J.; Wang, C., Expanded graphite as superior anode for sodium-ion batteries. *Nat. Commun.* **2014,** *5*, 4033, DOI 10.1038/ncomms5033.

8. Gaddam, R. R.; Yang, D.; Narayan, R.; Raju, K.; Kumar, N. A.; Zhao, X. S., Biomass derived carbon nanoparticle as anodes for high performance sodium and lithium ion batteries. *Nano Energy* **2016,** *26*, 346-352, DOI 10.1016/j.nanoen.2016.05.047.

9. Li, D.; Zhang, L.; Chen, H.; Wang, J.; Ding, L.-X.; Wang, S.; Ashman, P. J.; Wang, H., Graphene-based nitrogen-doped carbon sandwich nanosheets: a new capacitive process controlled anode material for high-performance sodium-ion batteries. *J. Mater. Chem. A* **2016,** *4* (22), 8630-8635, DOI 10.1039/C6TA02139E.

10. Zhang, X.; Zhu, G.; Wang, M.; Li, J.; Lu, T.; Pan, L., Covalent-organic-frameworks derived N-doped porous carbon materials as anode for superior long-life cycling lithium and sodium ion batteries. *Carbon* **2017,** *116*, 686-694, DOI 10.1016/j.carbon.2017.02.057.

11. Yin, F.; Lv, Y.; Che, R.; Wu, H.; Zhang, X.; Dong, G.; Zheng, G.; Zhao, D., Two-Dimensional Mesoporous Carbon Nanosheets and Their Derived Graphene Nanosheets: Synthesis and Efficient Lithium Ion Storage. *J. Am. Chem. Soc.* **2013,** *135* (4), 1524-1530, DOI 10.1021/ja310849c.