Supplemental materials

Rapid Synthesis of Nitrogen-Doped Graphene for Lithium ion Battery Anode with Excellent Rate Performance and Superlong Cyclic Stability

*Tao Hu,[a,b] Xiang Sun,[b] Hongtao Sun,[b] Guoqing Xin,[b] Dali Shao,[c] Changsheng Liu,[a] and Jie Lian[b]**

[a.] *Key Laboratory for Anisotropy and Texture of Materials of Ministry of Education Northeastern University, Shenyang, Liaoning 110004, China*
[b.] *Department of Mechanical, Aerospace & Nuclear Engineering, Rensselaer Polytechnic Institute, Troy, NY 12180, USA*
[c.] *Department of Electrical, Computer and Systems Engineering, Rensselaer Polytechnic Institute, Troy, NY 12180, USA*

[*] E-mail: lianj@rpi.edu

Table S1 Common nitrogen-doped graphene by different method using different dopants and experimental conditions

Nitrogen Source	Experimental method	Reaction time	Reference
~99% NH_3+Ar (1:2V/V)	Heat treatment	2 h	14
Acetonitrile vapors	CVD	3-15 min	15
Lithium nitride	Solvothermal	6 h or 10 h	17
Ammonia gas	Electrothermal	unknown	18
Nitrogen plasma	Plasma assisted	20 min	19
Urea	Hydrothermal	3 h	20

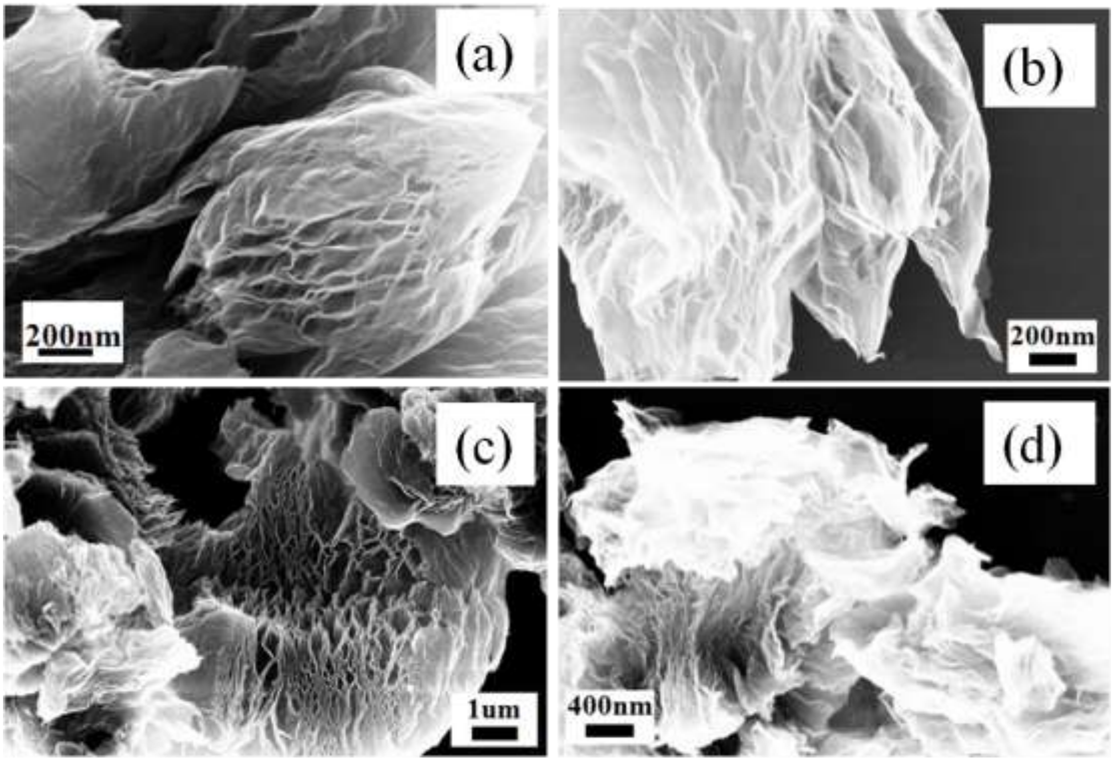

Figure S1. SEM images of the NGr show the porous morphologies (a) and the edge appearance (b)

Typical SEM images of the pGr at different magnifications(c and d).

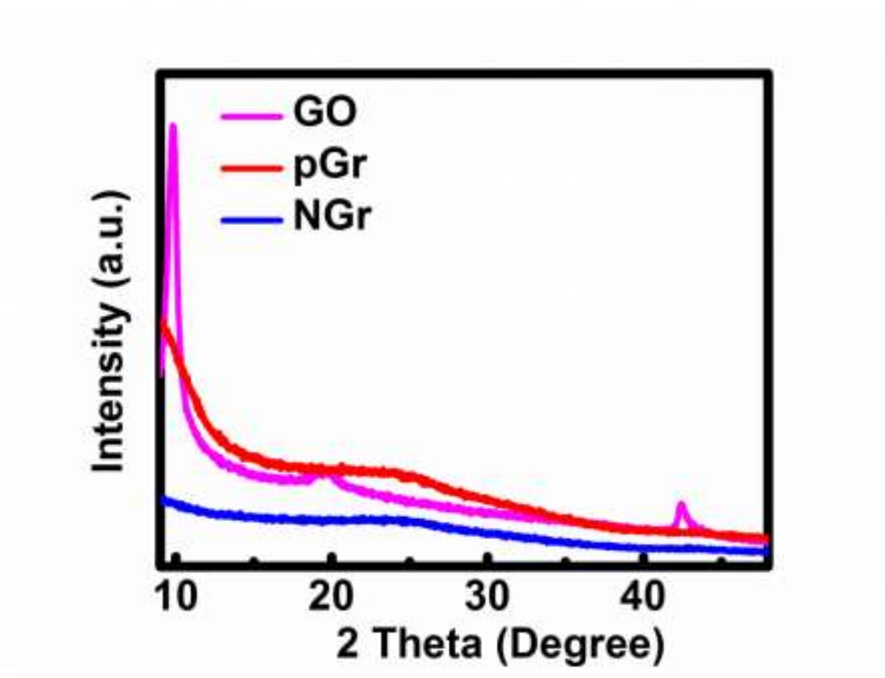

Figure S2. XRD patterns of pGr, NGr and GO

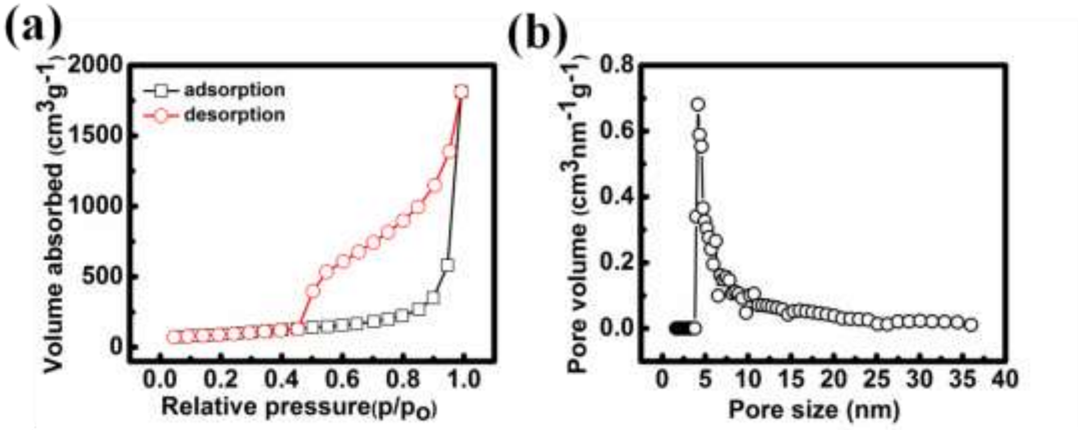

Figure S3. N_2 adsorption-desorption isotherm (a) and the pore size distribution plot (b) for the NGr powder

Table S2 Rate performance of the NGr electrode under 10, 20 and 30Ag^{-1}

Current density (Ag^{-1})	1st cycle			2000th cycle			Capacity retention (%)
	Charge ($mAhg^{-1}$)	Discharge ($mAhg^{-1}$)	Efficiency (%)	Charge ($mAhg^{-1}$)	Discharge ($mAhg^{-1}$)	Efficiency (%)	
10	163	190	85.8	179	180	99.4	94
20	90	119	75.6	106	106	101.9	87
30	47	76	61.8	65	65	100	85

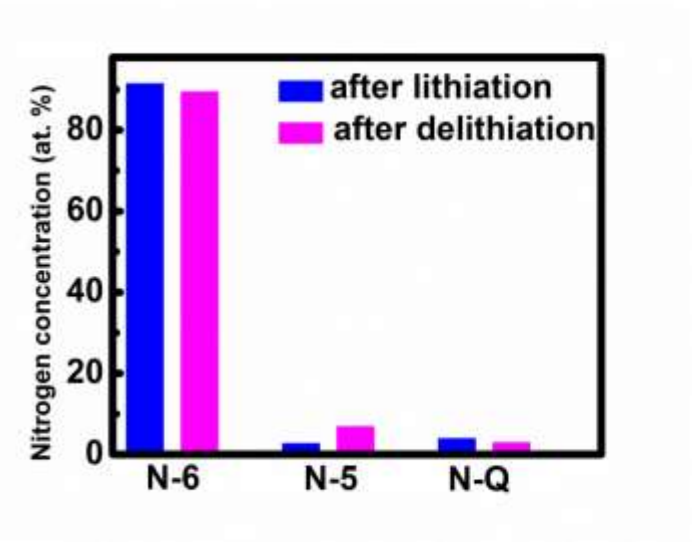

Figure S4. N species content of NGr electrodes by XPS after lithiation and delithiation

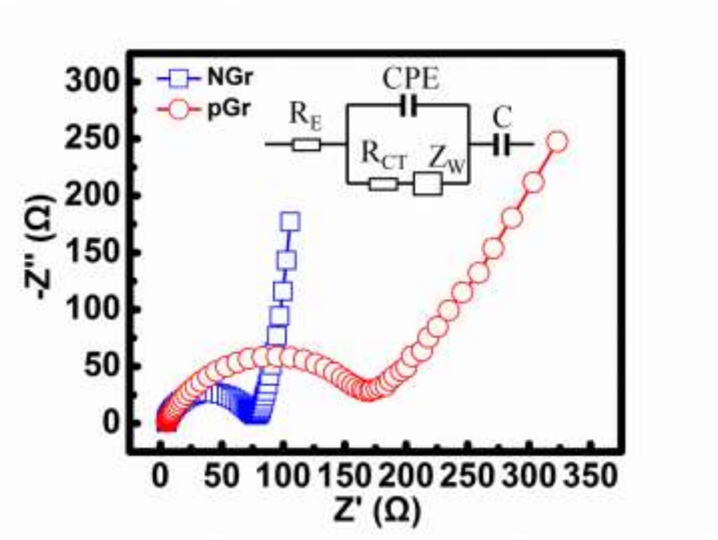

Figure S5. Nyquist plots of the pGr and NGr electrodes (inset, Modeled equivalent circuit of EIS)