Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information for

Nitrogen Doped Graphene via Thermal Treatment of Composite Solid Precursors as High Performance Supercapacitor

Enamul Haque[a], Md. Monirul Islam[b], Ehsan Pourazadi[c], Mahbub Hassan[a], Shaikh Nayeem Faisal[c], Anup Kumar Roy[c], Konstantin Konstantinov[b] , Andrew T. Harris[c] , Andrew I. Minett[c], Shi Xue Dou[b] and Vincent Gomes[a]*

[a]Integrated Polymer and Systems Engineering Group, School of Chemical & Biomolecular Engineering, The University of Sydney, NSW,Australia; Email: vincent.gomes@sydney.edu.au , Fax: +61 293512854, Tel: +61 293514868.

[b]Instutute for Superconducting and Electronic Materials, University of Wollongong, NSW, Australia.

[c]Laboratory for Sustainable Technology, School of Chemical & Biomolecular Engineering, The University of Sydney, NSW, Australia.

Table S1. Comparison of capacitance performance with literature reported N-doped graphene as well as other N-doped carbon materials:

Material	Doping precursors	Specific Capacitance, (F g^{-1})	Current Density (A/g)	Electrolyte	Ref.
Nitrogen-doped graphene	2-aminoterephthalic acid	210	1	0.5 M H_2SO_4	This Work
		239	0.5		
		286	0.2		
3D Nitrogen-doped Graphene-CNT	Pyrrole	180	0.5	6 M KOH	1
Crumpled Nitrogen-doped Graphene nanosheets	Cyanamide (NH_2CN)	245.9	1	$[Bu_4N]BF_4$ acetonitrile	2
N-doped Reduced Graphene Oxide	Urea	255	0.5	6 M KOH	3
Nitrogen-doped Graphene	Urea	326	0.2	6 M KOH	4
3D Nitrogen and Boron co-doped Graphene	Ammoniaborontriflouride (NH_3BF_3)	239	1	1 M H_2SO_4	5
Boron-doped graphene nanoplatelets	Borane-tetrahydrofuran (BH_3-THF)	160	1	6 M KOH	6
Nitrogen-doped Graphene	Phenylenediamine	301	0.1	6 M KOH	7
Nitrogen-enriched nanoporous carbon	Ammonia	198	0.05	6 M KOH	8
Nitrogen-enriched carbon nanotube	Melamine	167	1	1 M H_2SO_4	9
Nitrogen-doped porous carbon nanofiber	Polypyrrole	202	1	6 M KOH	10
Nitrogen-doped Graphene	Ammonia	138	1	1M $Et_4N\ BF_4$	19

Table S2. Comparative study of nitrogen-doing and nitrogen concentration in N-doped graphene.

Synthesis Method	Precursors	N Content %	Configuration of N	Ref
Thermal treatment	Graphene Oxide, aminoterephthalic acid	5.63	Pyridinic, Pyrrolic, Graphitic, Pyridinic N-oxides	This Work
CVD	Cu foil as catalyst, 1,3,5-triazine	2.1-5.6	Pyridinic, Pyrrolic, Graphitic,	11
Thermal treatment	Graphene Oxide, NH_3-Ar	2.0-2.8	Pyridinic, Pyrrolic, Graphitic	12
Arc Discharge	Graphite, H_2, He, Pyridine Vapor	0.6-1.4	Pyridinic, Graphitic	13
Solvothermal	Graphene Oxide, ammonia water	4.4	Pyridinic, Primary amine	14
Flame	Ni Catalyst, aminie, ethanol	1.4	Pyridinic, Graphitic	15
Flame	Graphene Oxide, amine	3.97	Pyridinic, Pyrrolic, Graphitic	16
Thermal Annealing	Graphene Oxide, Melamine	6.6-10.1	Pyridinic, Pyrrolic, Graphitic	17
Plasma treatment	Graphene , Nitrogen plasma	8.5	Pyridinic, Pyrrolic, Graphitic	18

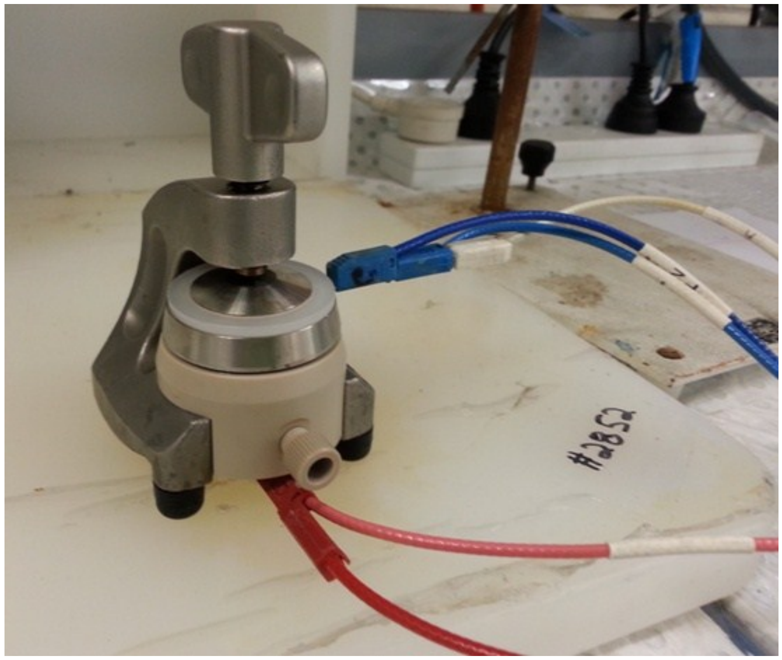

Figure S1. Digital photo of electric double layer capacitor (EDLC) constructed with N-doped graphene.

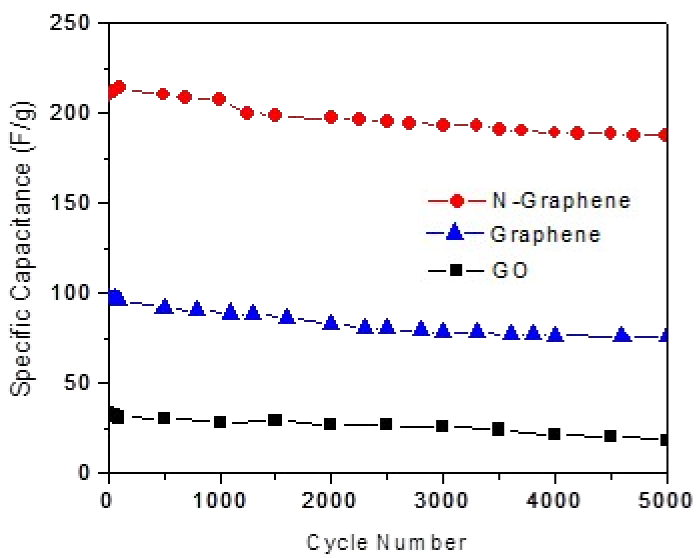

Figure S2. Comparison of cyclic performance at a current density of 1A/g.

References:

1. B. You, L. Wang, L. Yao and J. Yang, *Chem. Commun*., 2013**, 49***,* 5016.
2. Z. Wen, X. Wang, S. Mao, Z. Bo, H. Kim, S. Cui, G. Lu, X. Feng, and J. Chen, *Adv. Mater.,* 2012**, 24***,* 5610.
3. Z. Lei, L. Lu, and X. S. Zhao, *Energy Environ. Sci.,* 2012**, 5** , 6391.
4. L. Sun, L. Wang, C. Tian, T. Tan, Y. Xie, K. Shi, M. Li and H. Fu, *RSC Adv*. 2012, **2***,* 4498.
5. Z. –S. Wu, A. Winter, L. Chen, Y. Sun, A. Turchanin, X. Feng, and K. Müllen, *Adv. Mater*., 2012**, 24***,* 5130.
6. J. Han, L. L. Zhang, S. Lee,J. Oh, K. –S. Lee, J. R. Potts, J. Ji, X. Zhao, R. S. Ruoff and S. Park, *ACS Nano,* 2013**, 7***,*19-26.
7. Y. Lu, F. Zhang, T. Zhang, K. Leng, L. Zhang, X. Yang, Y. Ma, Y. Huang, M. Zhang and Y. Chen, *Carbon,* 2013**, 63***,* 508.
8. D. Hulicova-Jurcakova, M. Kodama, S. Shiraishi, H. Hatori, Z. H. Zhu and G. Q. Lu, *Adv. Funct. Mater.,* 2009**, 19***,* 1800.
9. G. Lota, K. Lota and E. Frackowiak, *Electrochem. Commun.,* 2007**, 9***,* 1828.
10. J. –F. Chen, X. –D. Zhang, H. –W. Liang, M. Kong, Q. –F. Guan, P. Chen, Z. –Y. Wu and S. –H. Yu, *ACS Nano,* 2012**, 6***,* 7092.
11. Y. F. Lu, S. T. Lo, J. C. Lin, W. J. Zhang, J. Y. Lu, F. H. Liu, C. M. Tseng, Y. H. Lee, C. T. Liang and L. J. Li, *ACS Nano*, 2013, **7**, 6522.
12. D. S. Geng, Y. Chen, Y. G. Chen, Y. L. Li, R. Y. Li, X. L. Sun, S. Y. Ye and S. Knights, *Energy Environ. Sci.*, 2011, **4**, 760.
13. L. S. Panchakarla, K. S. Subrahmanyam, S. K. Saha, A. Govindaraj, H. R. Krishnamurthy, U. V. Waghmare and C. N. R. Rao, *Adv. Mater.*, 2009, **21**, 4726.
14. X. S. Du, C. F. Zhou, H. Y. Liu, Y. W. Mai and G. X. Wang, *J. Power Sources,* 2013, **241**, 460.
15. Y. P. Zhang, B. Cao, B. Zhang, X. Qi and C. X. Pan, *Thin Solid Films,* 2012, **520**, 6850.
16. D. Li, C. Yu, M. Wang, Y. Zhang and C. Pan, *RSC Adv.* 2014, **4**, 55394.
17. Z. H. Sheng, L. Shao, J. J. Chen, W. J. Bao, F. B. Wang and X. H. Xia, *ACS Nano*, 2011, **5**, 4350.
18. Y. Y. Shao, S. Zhang, M. H. Engelhard, G. S. Li, G. C. Shao, Y. Wang, J. Liu, I. A. Aksay and Y. H. Lin, *J. Mater. Chem.,* 2010, **20**, 7491.
19. Y. Qiu, X. Zhang and S. Yang, Phys. Chem. Chem. Phys., 2011, **13**, 12554.