Supporting Information

Synergy of Black Phosphorus-Graphite-Polyaniline Based Ternary Composite for Stable High Reversible Capacity Na-ion Battery Anodes

Hongchang Jin,[†] *Taiming Zhang,*[†] *Chenghao Chuang,*[‡] *Ying-Rui Lu,*[§] *Ting-Shan Chan,*[§] *Zhenzhen Du,*[†] *Hengxing Ji*[†,*] *and Li-jun Wan*[†,#]

[†]Department of Applied Chemistry, CAS Key Laboratory of Materials for Energy Conversion, iChEM, University of Science and Technology of China, Hefei 230026, China

[‡]Department of Physics, Tamkang University, Tamsui 25137, New Taipei City, Taiwan

[§]National Synchrotron Radiation Research Center, Hsinchu 30076, Taiwan

[#]CAS Key Laboratory of Molecular Nanostructure and Nanotechnology and CAS Research/Education Center for Excellence in Molecular Sciences, Institute of Chemistry, Chinese Academy of Sciences (CAS), Beijing 100190, China

***Corresponding Author**: jihengx@ustc.edu.cn

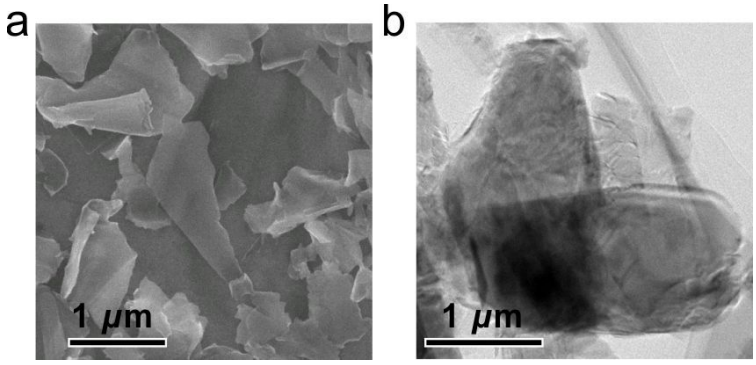

Figure S1. (a) SEM and (b) TEM images of few-layer BP.

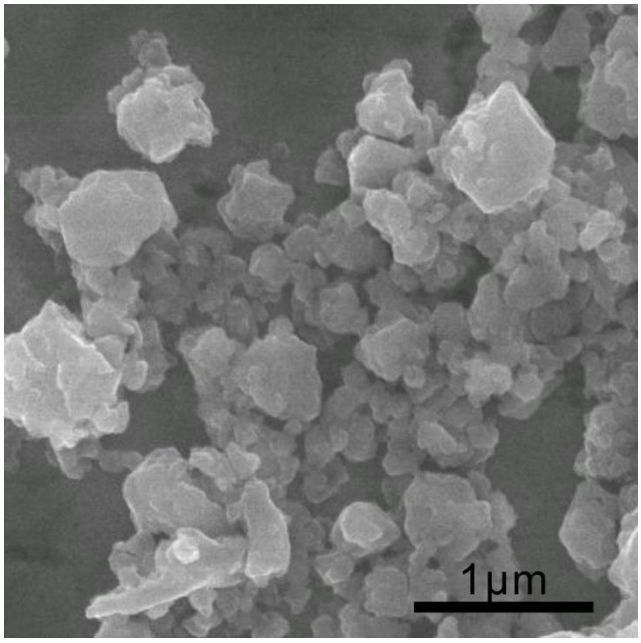

Figure S2. SEM image of BP-G.

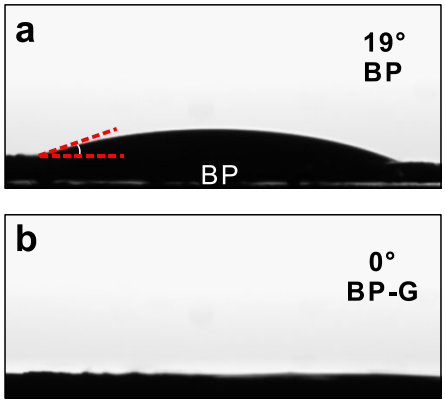

Figure S3. Characterization of wetting properties. Optical images of contact angles between electrolyte and (a) BP and (b) BP-G electrodes.

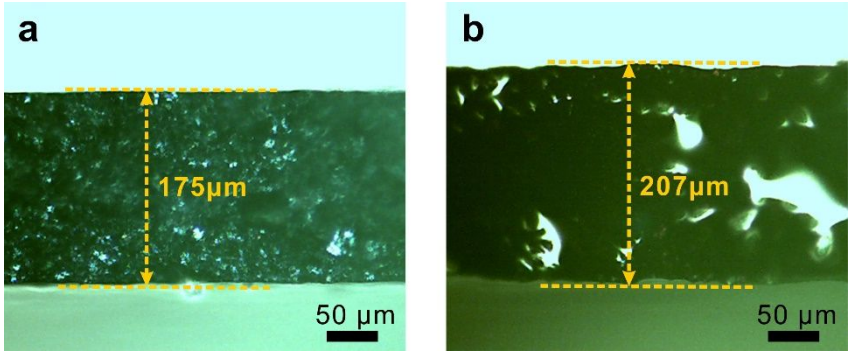

Figure S4. Cross sectional optical images of PANI mat (a) before and (b) after filtration in the electrolyte.

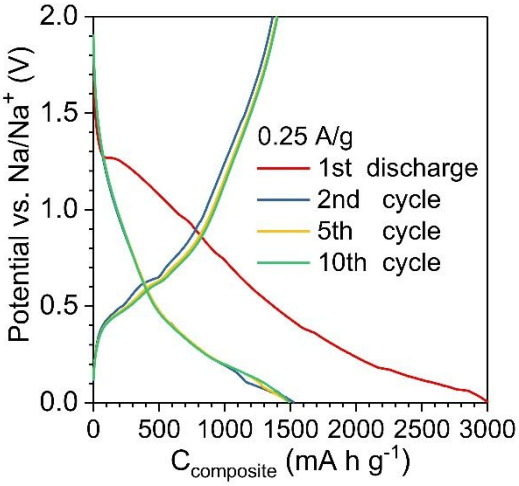

Figure S5. Galvanostatic discharge/charge profiles of BP-G/PANI at the current density of 0.25 A g^{-1}.

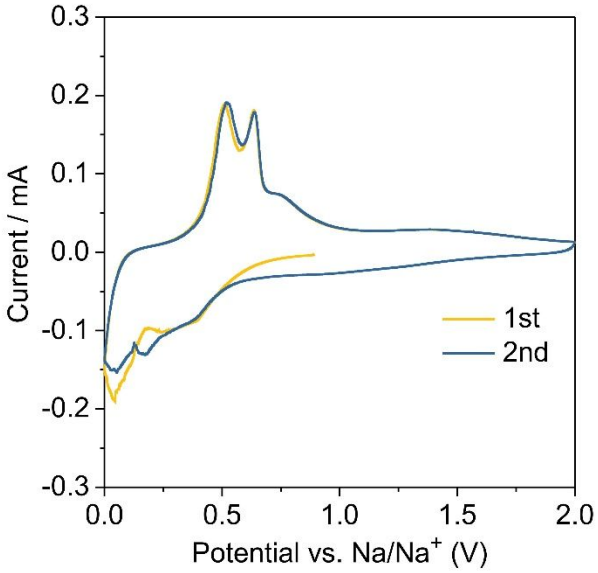

Figure S6. Cyclic voltammetry of BP-G/PANI with a scan rate of 0.1 mV s^{-1}.

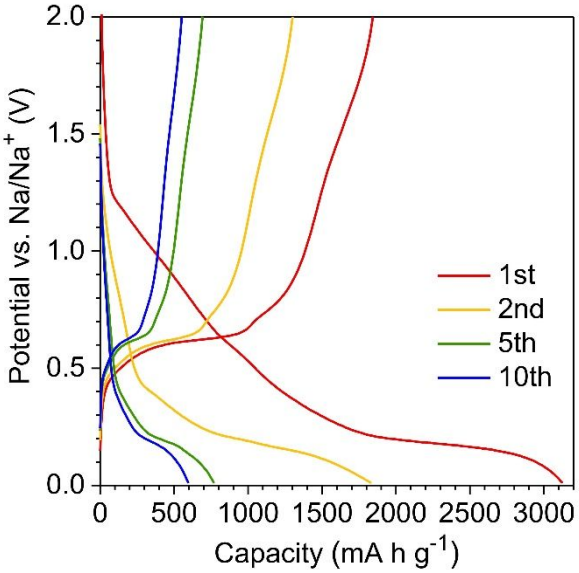

Figure S7. Galvanostatic discharge/charge profiles of BP-G at the current density of 0.5 A g^{-1}.

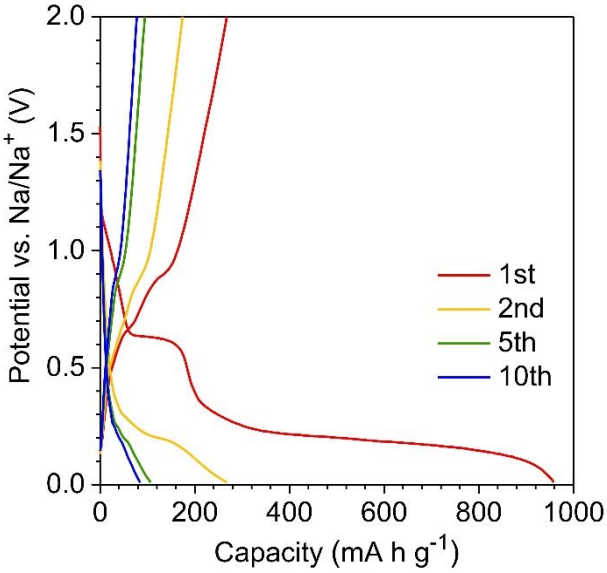

Figure S8. Galvanostatic discharge/charge profiles of BP at the current density of 0.5 A g^{-1}.

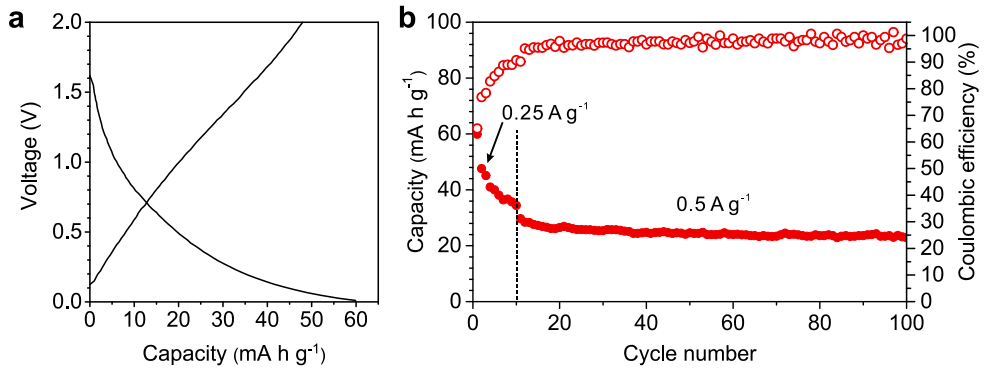

Figure S9. (a) The galvanostatic discharge and charge profile at 0.25 A g^{-1}. (b) and cycling performance at 0.25 and 0.5 A g^{-1}.

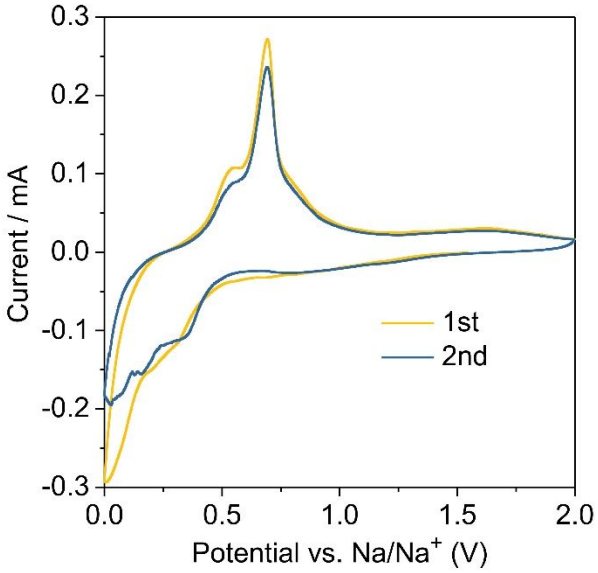

Figure S10. Cyclic voltammetry of BP-G with a scan rate of 0.1 mV s^{-1}.

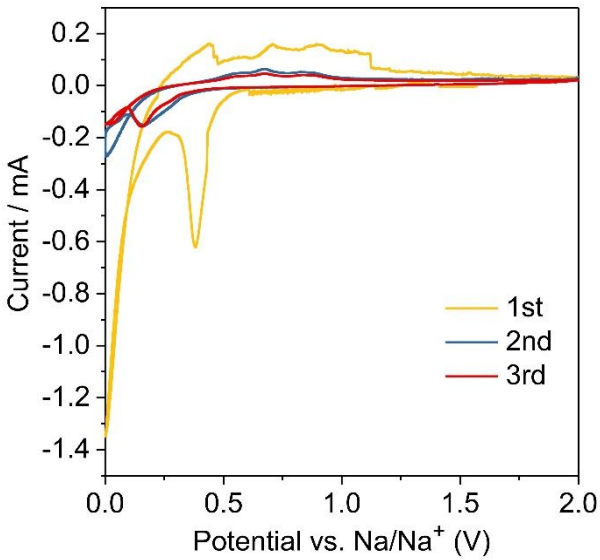

Figure S11. Cyclic voltammetry of few-layer BP with a scan rate of 0.1 mV s^{-1}.

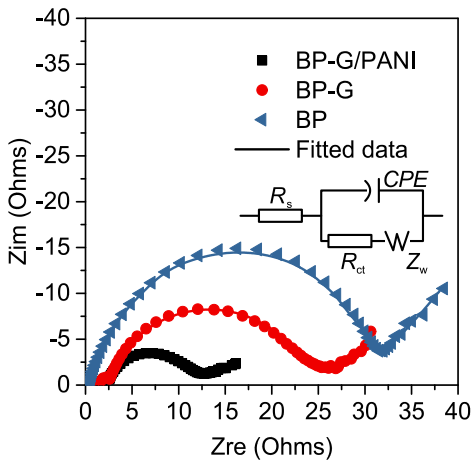

Figure S12. Nyquist plots of BP, BP-G and BP-G/PANI at initial state. Inset: A modified Randles equivalent circuit. R_S: ohmic resistance of solution and electrodes, R_{ct}: charge transfer resistance, Q: double layer capacitor, Z_W: Warburg impedance.

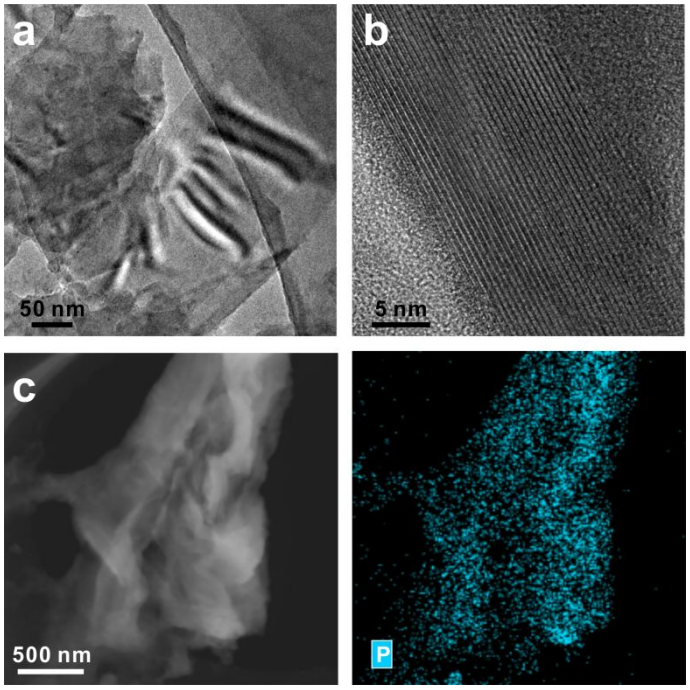

Figure S13. (a) TEM image, (b) HRTEM image and (c) TEM image mapping images of BP after 100 cycles.

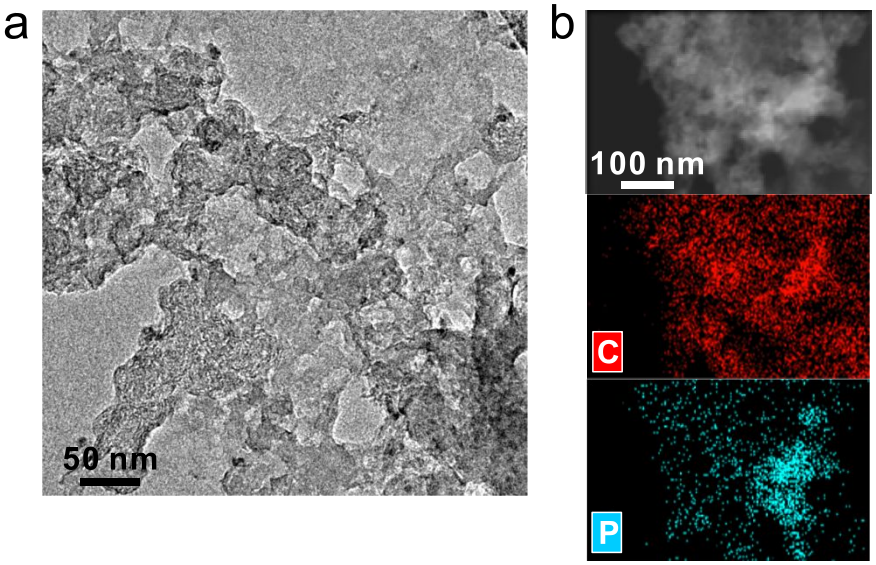

Figure S14. (a) TEM image and (b) TEM image mapping images of BP-G after 100 cycles.

Table S1. Comparison of the initial coulombic efficiency, active material (AM) content in composite, mass loading and cyclic stability between the current BP-G/PANI composite and other anode materials in SIBs.

Material	Initial CE (%)	AM content (wt%)	Mass loading (mg cm^{-2})	Capacity (mA h g^{-1})	Current density (A g^{-1})	Cycle number	Ref.
BP-G/PANI	51	65%	0.8-1.2	1120 780 530	0.5 2.5 4	100 150 1000	Our work
E-BP/ PEDOT	51.5	90.2	1	700 450	2 5	5 5	[ref. 1]
FL-P-5	55	100	0.66	500	1.5	100	[ref. 2]
BPC	90	70	1.5	1155	1.3	100	[ref. 3]
4-RBP	64	38.1	1.5	240	1	200	[ref. 4]
P@N-MPC	54.1	22.6	1.1-1.5	450	1	1000	[ref. 5]
HPCNS/P	47.5	81.12	Not mentioned	487	1	1000	[ref. 6]
Graphitic Carbon	33.3	100	Not mentioned	90	1.86	1400	[ref. 7]
TiO_2 Microspheres	38.3	100	2-3	177	0.25	1000	[ref. 8]
$Cu_3P–Co_2P/N–C$	71.2	58.4	Not mentioned	480	1	2000	[ref. 9]
CuP_2	59	79.6	Not mentioned	630	0.5	50	[ref. 10]
ZnSe	92.2	77	1.5	362	1	1000	[ref. 11]
SnS@Carbon Spheres	67	54.9	2	1027	0.2	100	[ref. 12]

References

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