Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

Electrospray Synthesis of Nano-Si Encapsulated in Graphite/carbon Microplates as Robust Anode for High Performance Lithium-ion Batteries

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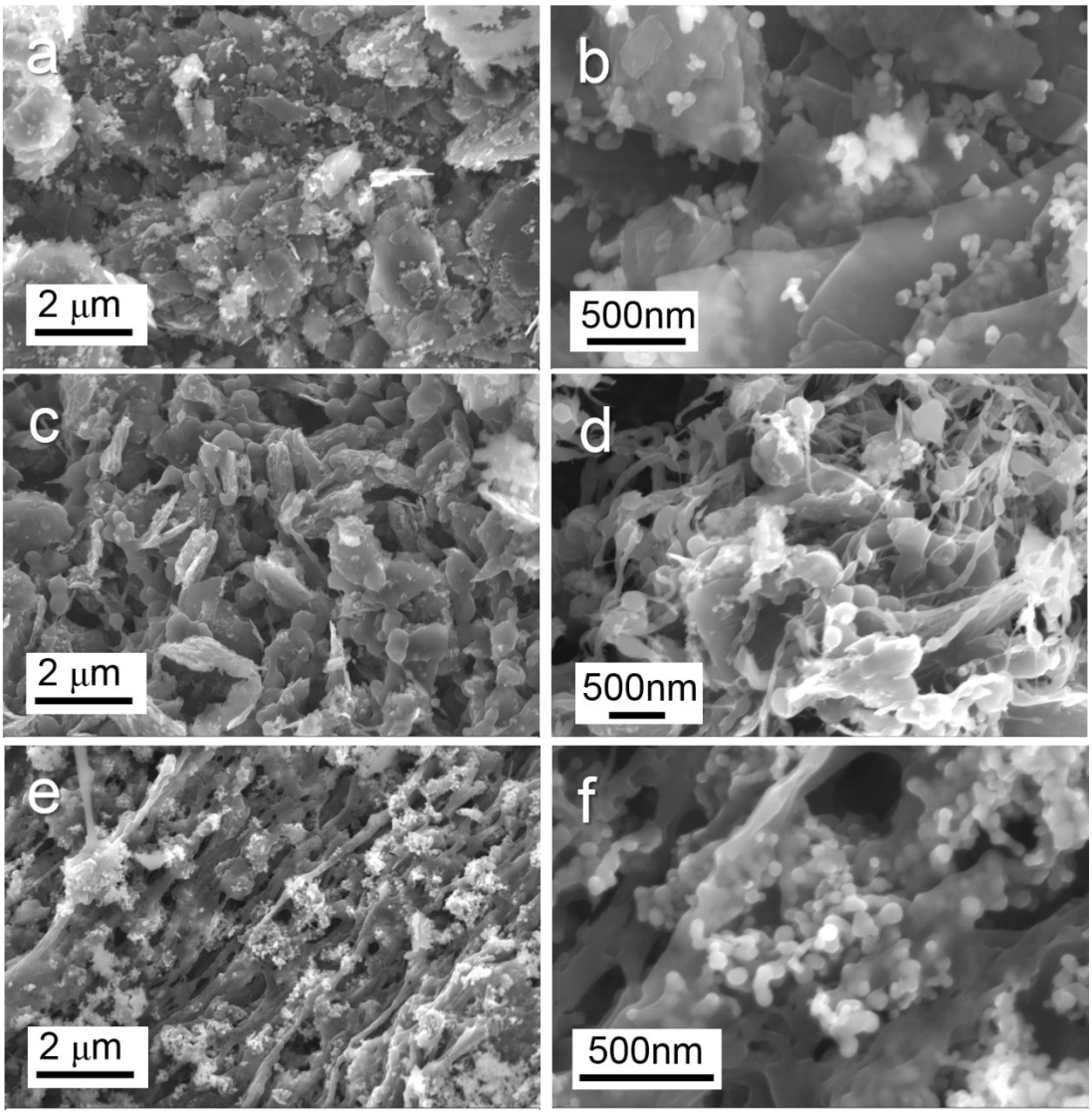

Figure S1. (a), (b) SEM images of Si/G composite from ball milling. (c), (d) SEM images of Si/G/C composite. (e), (f) SEM images of Si/C through electrospray and pyrolysis.

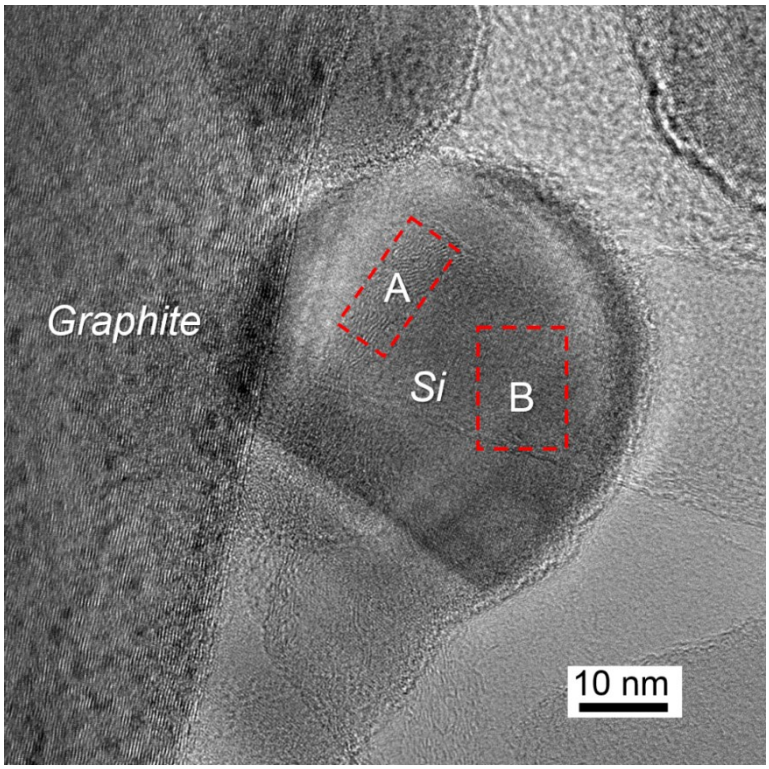

Figure S2. HR-TEM image of Si/G/C. the area A and B in red dashed box indicates the crystalline zone and the amorphous zone of silicon particles, respectively.

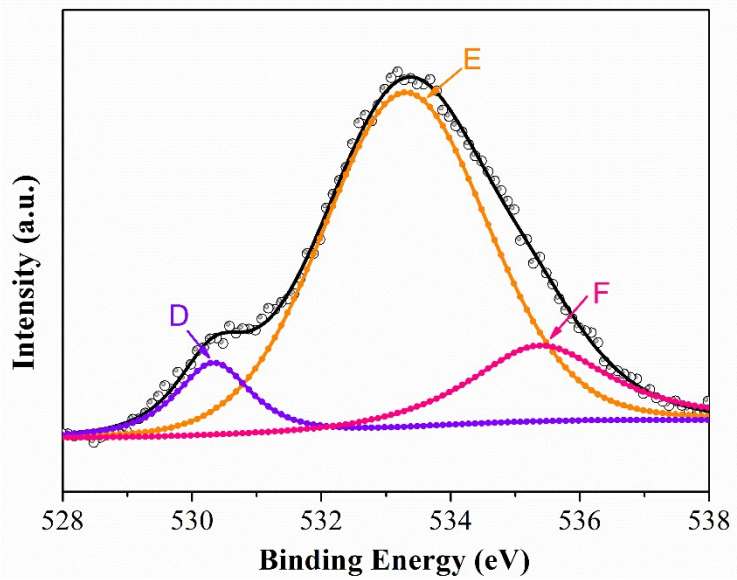

Figure S3. Deconvoluted O 1s XPS spectra derived from Si/G/C.

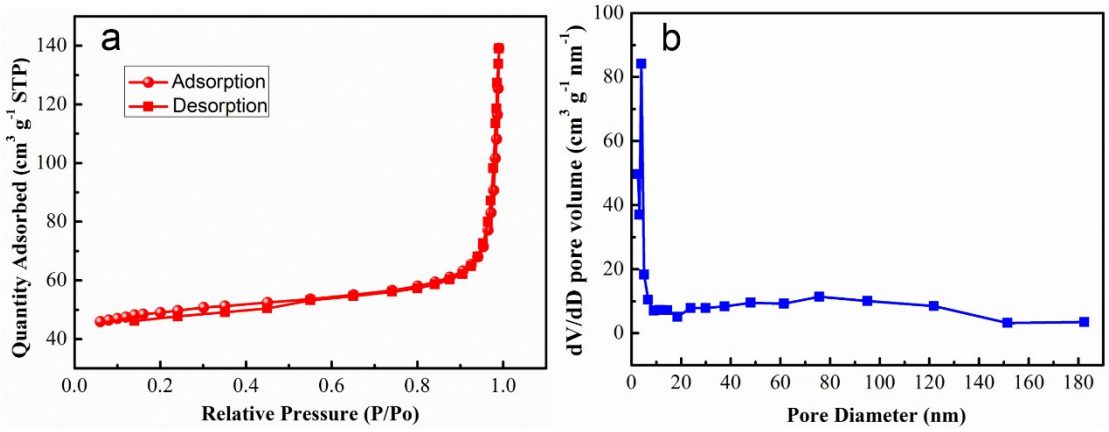

Figure S4. (a) N_2 adsorption-desorption isotherms of Si/G/C at 77 K. (b) Barrett-Joyner-Halenda desorption pore-size distribution of Si/G/C.

Table S1 Comparison of the preparation and electrochemical performances of reported Si/graphite-based anode materials.

Active materials	Preparation method	Silicon content (wt%)	Current density (mA/g)	Initial capacity (mAh/g)	Cycling performance	Ref.
Nano-Si/Graphite composite	Ball milling; polysaccharides binder	20	50	760~870	800 mAh/g over 150 cycles	【1】
Si@SiO_x@Ni/Graphite composite	Two-step ball milling from SiO	31.8	1000	1444.7	601 mAh/g over 50 cycles	【2】
Graphite/Si@C	Mechanical milling, spray drying and pitch pyrolysis	15.7	~100	637.7	570.7 mAh/g after 100 cycles	【3】
Si-graphite-binder (polyetherimide)	Ball milling	5	~50	~·1550	514 mAh/g after 350 cycles	【4】
Si/C microrods on graphite microspheres	CVD process	12	50	616.7	590.5 mAh/g after 50 cycles	【5】
Ultranano-Si/Graphite flakes	Etching of recycled Si wafer and ball milling	75	800	~1500	1200 mAh/g over 300 cycles	【6】
Nano-Si/Graphite/C spherical composite	Ball milling and petroleum pitch pyrolysis at 1000 ℃	20		~700	~650 over 50 cycles	【7】
Si/C/Graphite composite	Carbonization of coal-tar pitch	17	130	712	569.6 mAh/g after 100 cycles	【8】

Si/Graphite composite	Thermal decomposition of cyclopentasilane precursor	21.6	840	/	850 mAh/g over 100 cycles	【9】
Si-nanolayer-embedded graphite/C hybrid	CVD process	6	~55	517	~500 mAh/g after 100 cycles	【10】
Si-metal alloys/Graphite	Arc melting and ball milling; poly (vinyl alcohol) binders	~7	94.8	~460	~400 mAh/g after 100 cycles	【11】
Nano-Si@C	Carbonization of PAN at 1000 ℃	9.8	50	757	680 mAh/g after 100 cycles	【12】
Nano-Si@Graphite/C microspheres	Ball milling, spray drying, pyrolysis of glucose and polyvinylpyrrolidone	16	200	756	400 mAh/g after 300 cycles	【13】
Si/Flake Graphite/Carbon Composite	Ball milling and carbonization of mesophase pitch	~17	~180	634	517 mAh/g after 200 cycles	【14】
Si/Graphite/Disordered carbon	Ball milling and high-temperature annealing; different electrolytes	17.3	168	~840	420 mAh/g after 260 cycles	【15】
Nano-Si/graphite@graphene composite	Spray drying and sintering	16%	100	803.3	~500 mAh/g after 50 cycles	【16】
Sub-micron silicon/Pyrolyzed carbon@graphite	Spray-drying-assisted self-assembly	6.7	100	556	428 mAh/g after 100 cycles	【17】
Si-Co-C composite	High energy mechanical milling	20	50	1283.3	610 mAh/g after 50 cycles	【18】
Nano-silicon/graphite composite	Mixing; Using conductive polymer binder	20	~100	~900	~630 mAh/g after 100 cycles	【19】
Silicon/ Graphite-tin	High energy mechanical milling	70	237	1790	~700 mAh/g after 25 cycles	【20】
Nano-Si/Graphite/C microplates	Ball milling and electrospray	21.8	200	1295	523 mAh/g after 200 cycles	This work

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