Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Bean pod-like Si@dopamine-derived amorphous carbon@N-doped graphene nanosheet scrolls for high performance lithium storage

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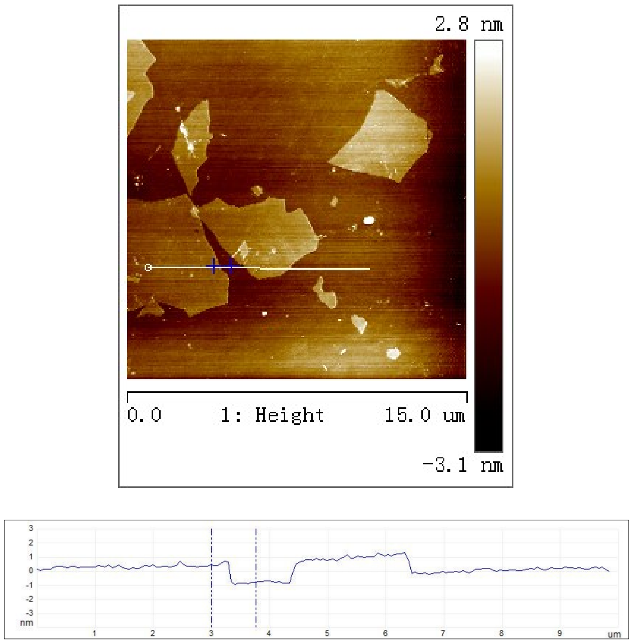
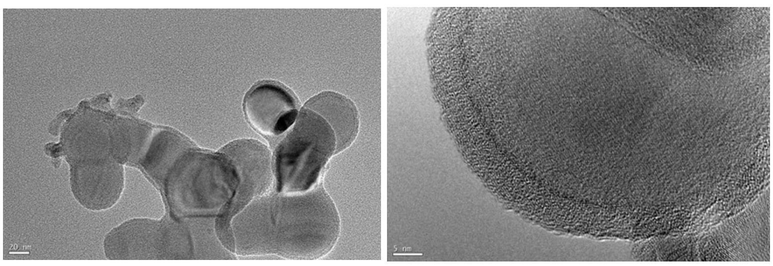


Fig. S1 AFM image of as-prepared GO nanosheets and corresponding cross-sectional profile. The GO nanosheets have a size of 4-6 μm and thickness of 1.2 nm.



(a) (b)

Figure S2 (a) Low magnification and (b) high magnification HRTEM image of dopamine molecules decorated on surface of SiNPs after annealing at 800 ^{o}C. It can be observed that the adsorbed dopamine molecules are converted to a thin layer of amorphous carbon with a thickness of ~5 nm after thermal annealing. The dopamine derived amorphous carbon is denoted as DDAC.

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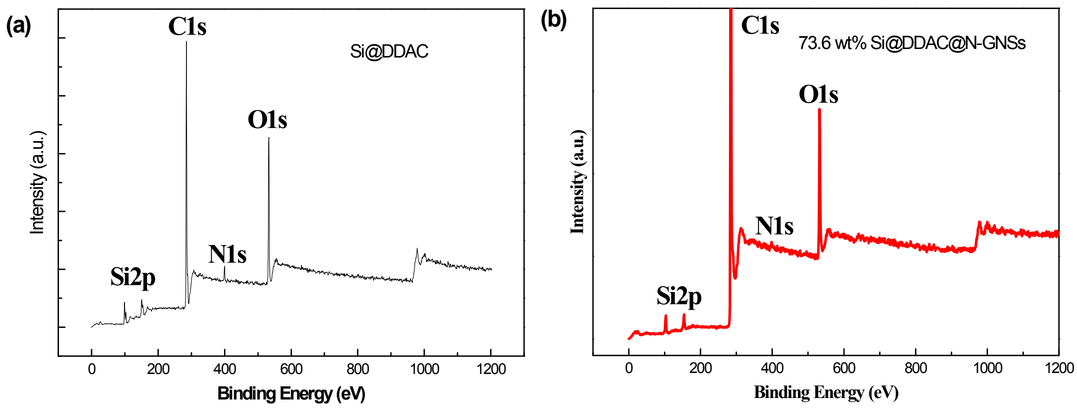

Fig. S3 Survey XPS spectra of (a) Si@DDAC and (b) GNS (73.6 wt% of Si, Sample B).

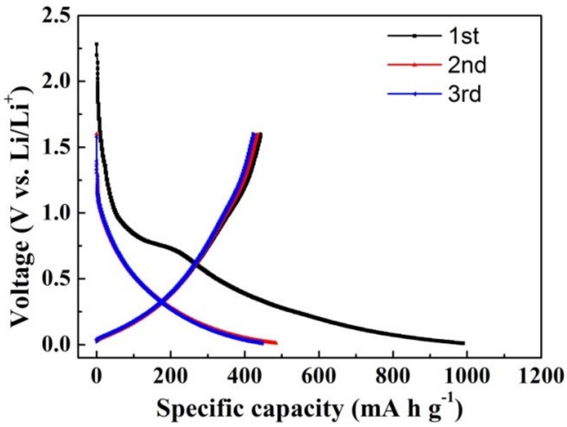

Fig. S4 Initial discharge/charge curves of rGO electrode at a current density of 0.3 A g^{-1}.

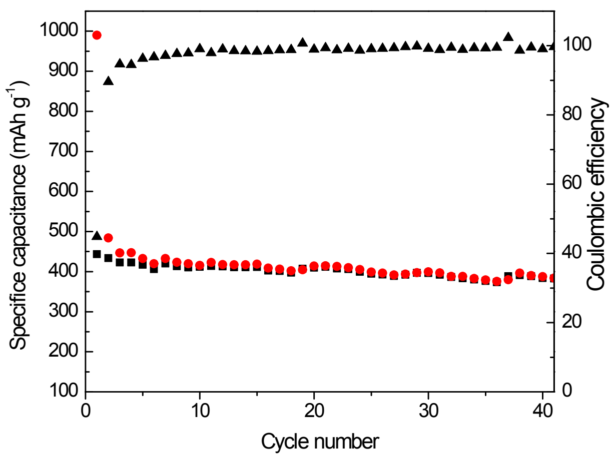

Fig. S5 Cycling stability of rGO at current density of 0.3 A g^{-1}.

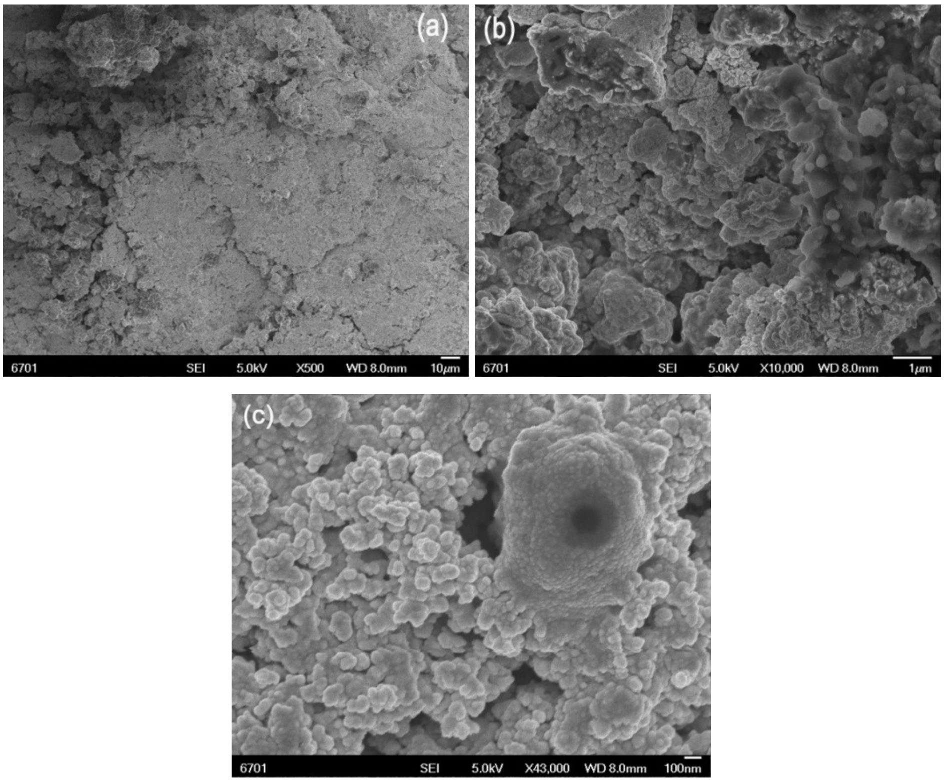

Fig. S6 (a) low-magnification and (b, c) high-magnification FESEM image of pristine Si-based electrode on Cu foil after cycling 110 cycles at 2 A g^{-1}.

Table S1 Lithium storage performance comparison of Si@DDAC@N-GNS and Si-based anodes in previous reports.

Electrode structure	Preparation method	charge capacity (1^{st})	CE (1^{st})	Rate capability	Cycling stability	Ref.
Lily-like GS wrapped SiNPs	Spray-drying	1525 mAh/g at 0.1A/g	70%	1300 mAh/g at 0.6 A/g	98.4% after 30 cycles (0.2 A/g) C	23
Crumpled G-Encapsulated Si NPs	Ultrasonification-assisted furnace drying	1200 mAh/g at 0.2 A/g	73%	>600 mAh/g at 4 A/g	83% after 250 cycles at1A/g	22
3D G-wrapped porous Si sphere	LBL & mgnesiothermic reduction	>2750 mAh/g at 0.21A/g^{E}	N.A.	697.8 mA h g^{-1} at 2.1 A/g	1299 mAh/g after 25 cycles at 0.21 A /g	34
Multilayered Si NPs/rGO	Alternating dip-coating	2300 mAh/g at 0.12A/g	73.0%	700 mAh/g at 24 A/g	765 mAh g^{-1} (7.2A/g), no fading	58
mSi@GNG	Freeze-drying & hydrazine reduction	1551 mAh/g at 0.1 A/g	85.6%	548 mAh/g at 0.5 A/g	93.1% after 80 cycles at 0.5 A/g ^{C}	59
CNFs/SiNPs@rGO	Electrospining & electrostatic self-assembly	1519 mAh/g at 0.89A/g	38%	N.A.	69% after 200 cycles at 0.89A/g ^{C}	60
NG/Si@NC	Freeze-drying&cabonization	1138 mAh/g at 0.5 A/g ^{C}	76%	975 mAh/g at 2 A/g	82% after 100 cycles at 0.5 A/g	41
Si@DDAC@N-GNSs	Freeze-drying&cabonization	2243 mAh/g at 0.3 A/g	74.9%	947.8 mAh/g at 3 A/g	91.5% after 110 cycles at 2 A/g	Our work

■ C Calculated from the published data. ■ E Estimated from published graph. G, rGO, CNF, SiNPs, mSi and GNG represent for graphene, reduced graphene oxide, carbon nanofiber, silicon nanoparticles, micro-sized silicon and giant nitrogen-doped graphene, respectively. CE stands for Coulombic efficiency. LBL represents for layer-by-layer assembly.