Supporting Information

Electrochemical performance enhancement of micro-sized porous Si by integrating with nano-Sn and carbonaceous materials

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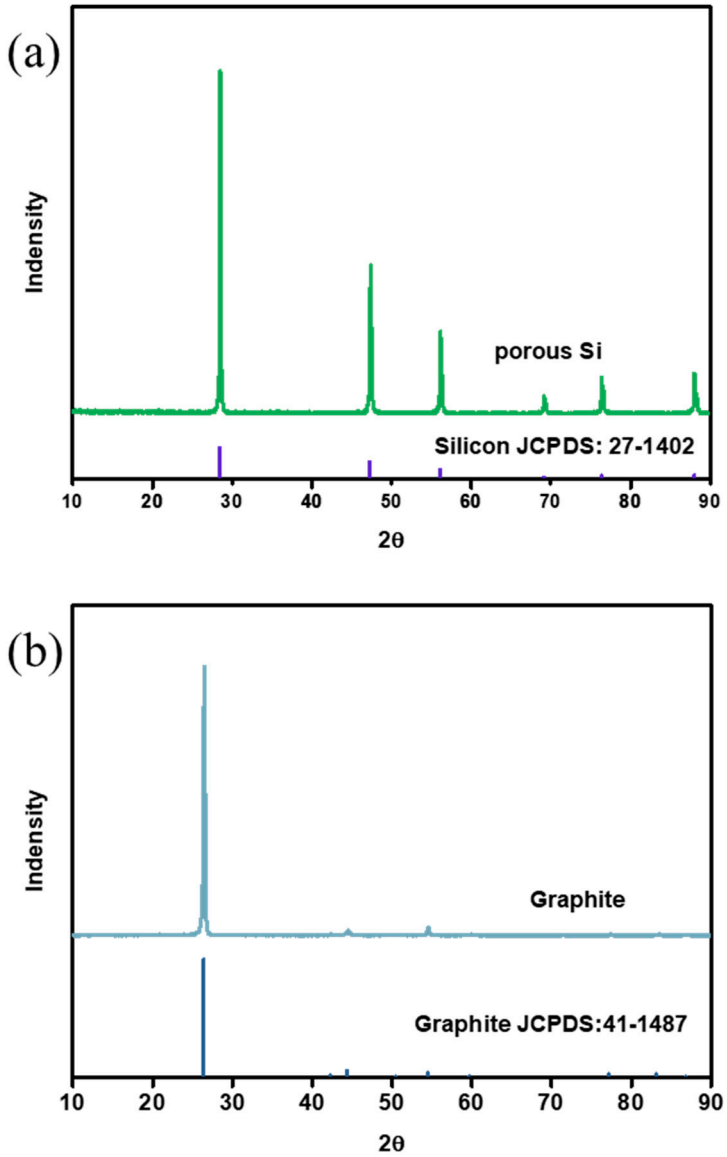

Figure S1. XRD pattern of (a) porous Si, (b) graphite.

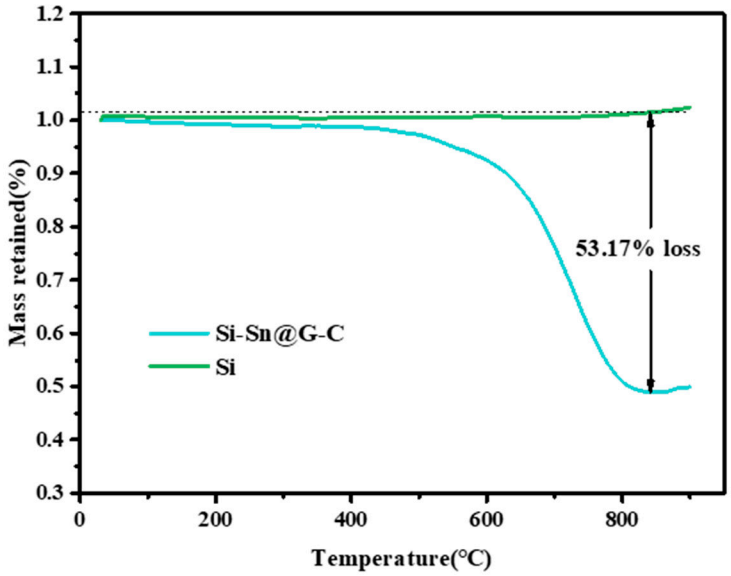

Figure S2. TGA curve of Si-Sn@G-C composite.

Table S1. Comparison of electrochemical performance of Si based anodes in literature.

Electrode	Si source	ICE	Highest capacitances obtained (mAh g^{-1})	Capacity retention	Ref
Si/graphite	Si powder (nano-sized)	77%	1001 mAh g^{-1} at 0.1 A g^{-1}	80% capacity retention over 100 cycles	[1]
Silicon sponge	Si wafer	56%	790 mAh g^{-1} at 0.1 A g^{-1}	~92.0% capacity retention over 300 cycles	[2]
Si/C composite	Si powder (1-2 μm, 99.99%)	82%	1860 mAh g^{-1} at 0.1 A g^{-1}	68% capacity retention over 60 cycles	[3]
Si/C composite	Al-Si alloy ingot	61%	952 mAh g^{-1} at 0.2 A g^{-1}	86.8% capacity retention over 300 cycles	[4]
Si/graphite/pyrolytic carbon (SiGC)	micro-sized Si powder	>80%	818 at 0.1 A/g	83.6% capacity retention over 300 cycles	[5]
Porous C-Si	$SiCl_4$	88%	2820 mAh g^{-1} at 0.4 A g^{-1}	99% capacity retention over 100 cycles	[6]
(Si-SiO-SiO_2)-C composite	SiO (325 mesh)	80%	1280 mAh g^{-1} at 0.2 A g-1	99.5% capacity retention over 200 cycles	[7]
Si/Sn@C-G	Si powder (nano-sized)	81%	1022 mAh g^{-1} at 0.1 A g^{-1}	60% capacity retention over 100 cycles	[8]
Si-Sn-DHCNFs(double-holed carbon nanofibers)	Si powder (nano-sized)	66%	1074 mAh g^{-1} at 0.1 A g^{-1}	54% capacity retention over 31 cycles	[9]
Si/Sn composites	SiSnAl alloy	76%	2466 mAh g^{-1} at 0.2 A g^{-1}	63% capacity retention over 70 cycles	[10]
Si/Sn@G-C(as prepared)	Fe-Si alloy powder	79%	1227 mAh g^{-1} at 1 A g^{-1}	96% capacity retention over 100 cycles	as prepared

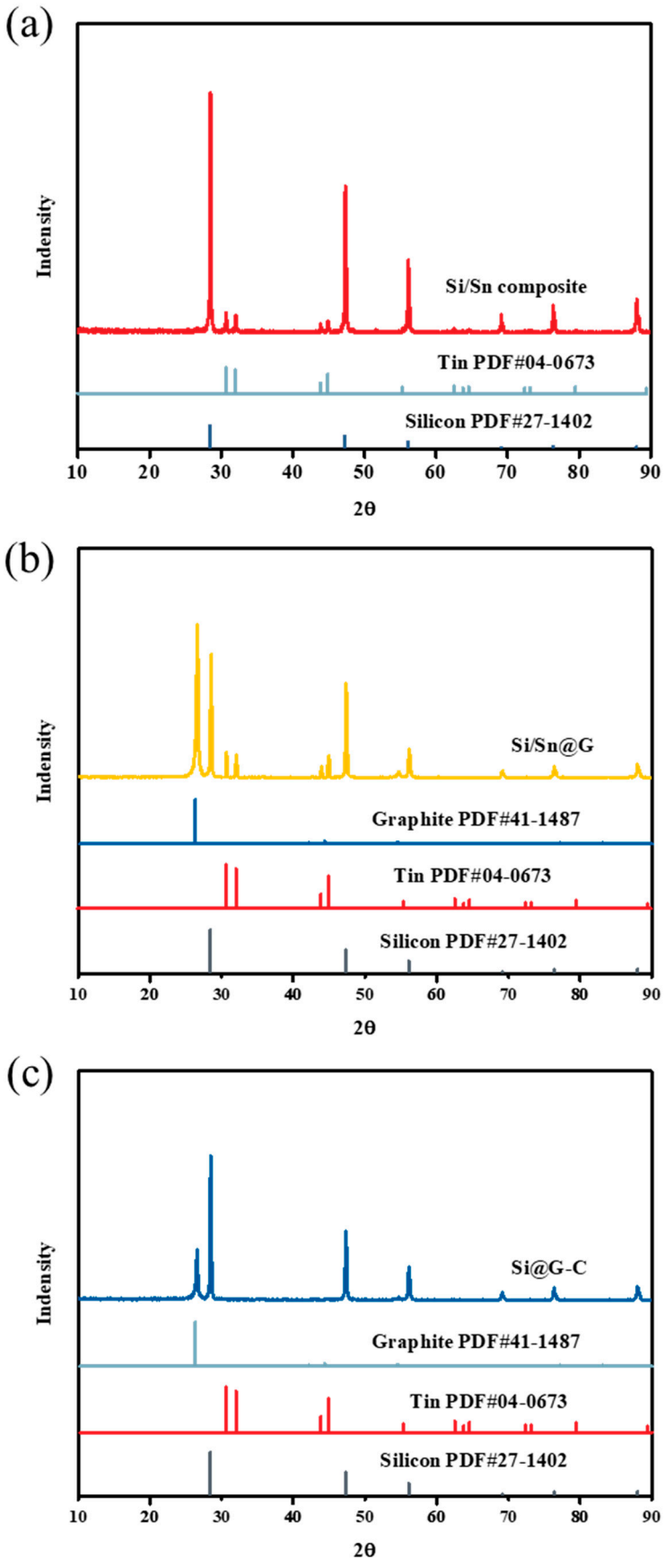

Figure S3. XRD pattern of (a) Si-Sn composite (b) Si/Sn@G composite and (c) Si@G-C composite.

Table S2. The corresponding elemental contents of the EDS of Si/Sn@G-C composite in Figure 2f-i.

Element	wt%	atom%
C	80.88	88.85
Si	9.41	4.43
Sn	1.80	0.20
O	7.91	6.52

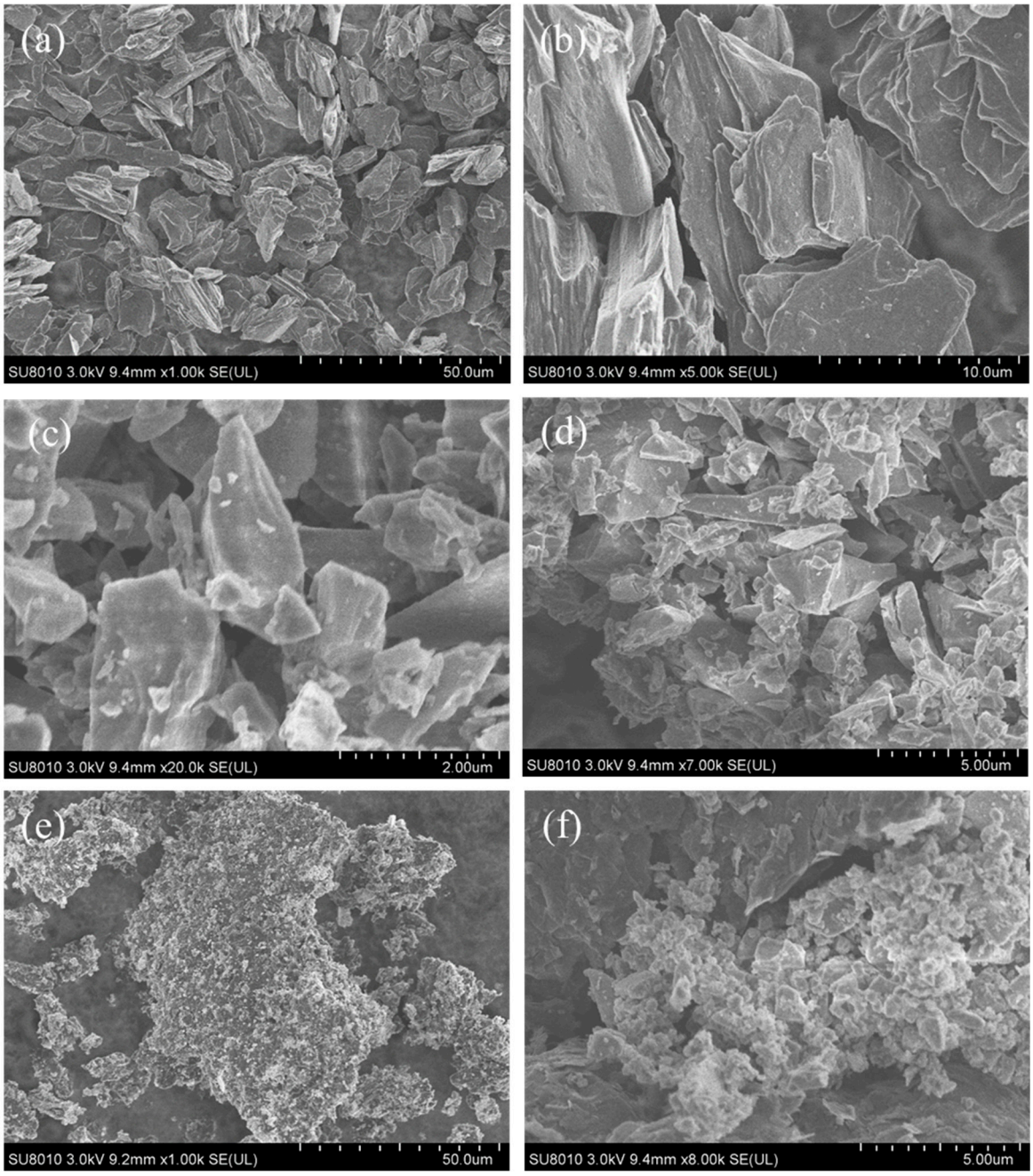

Figure S4. Top-down SEM of (a, b) the graphite (c, d) porous Si (e) Si@G-C composite, (f) Si/Sn@G composite.

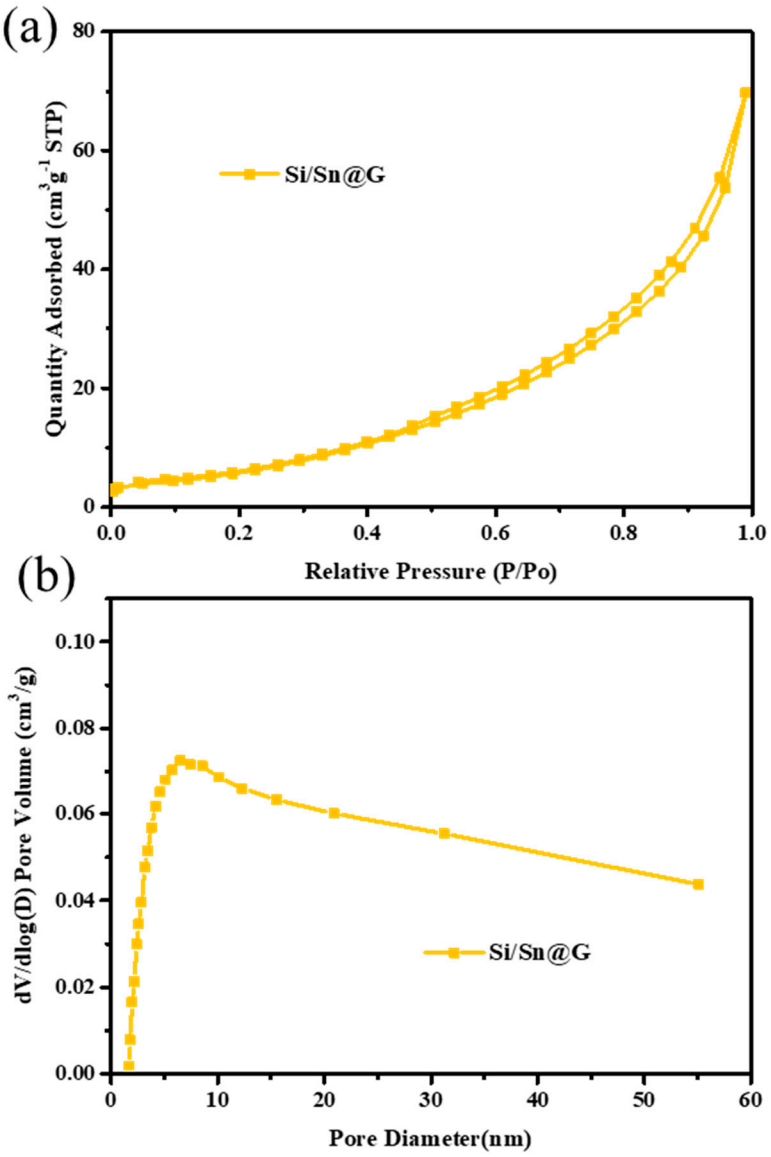

Figure S5. The BET results of the Si/Sn@G (a,) The N_2 absorption and desorption curves of the composites and (b) the corresponding pore size distribution.

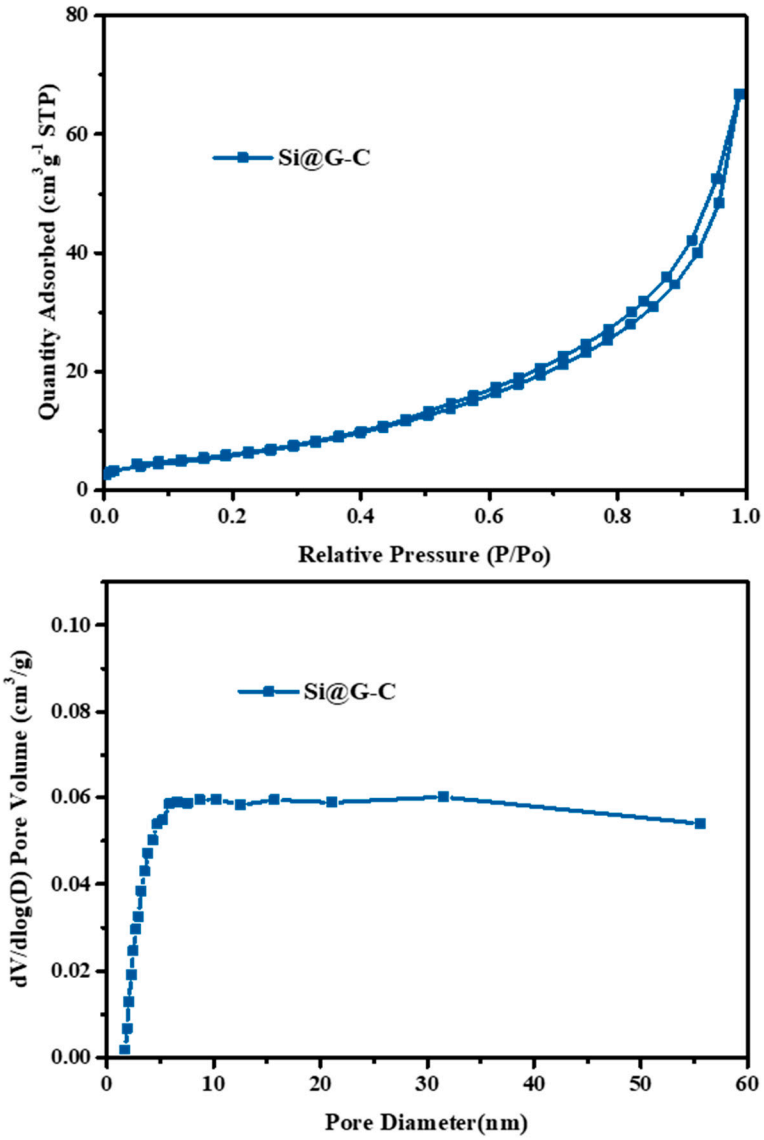

Figure S6. The BET results of the Si @G-C (a,) The N_2 absorption and desorption curves of the composites and (b) the corresponding pore size distribution.

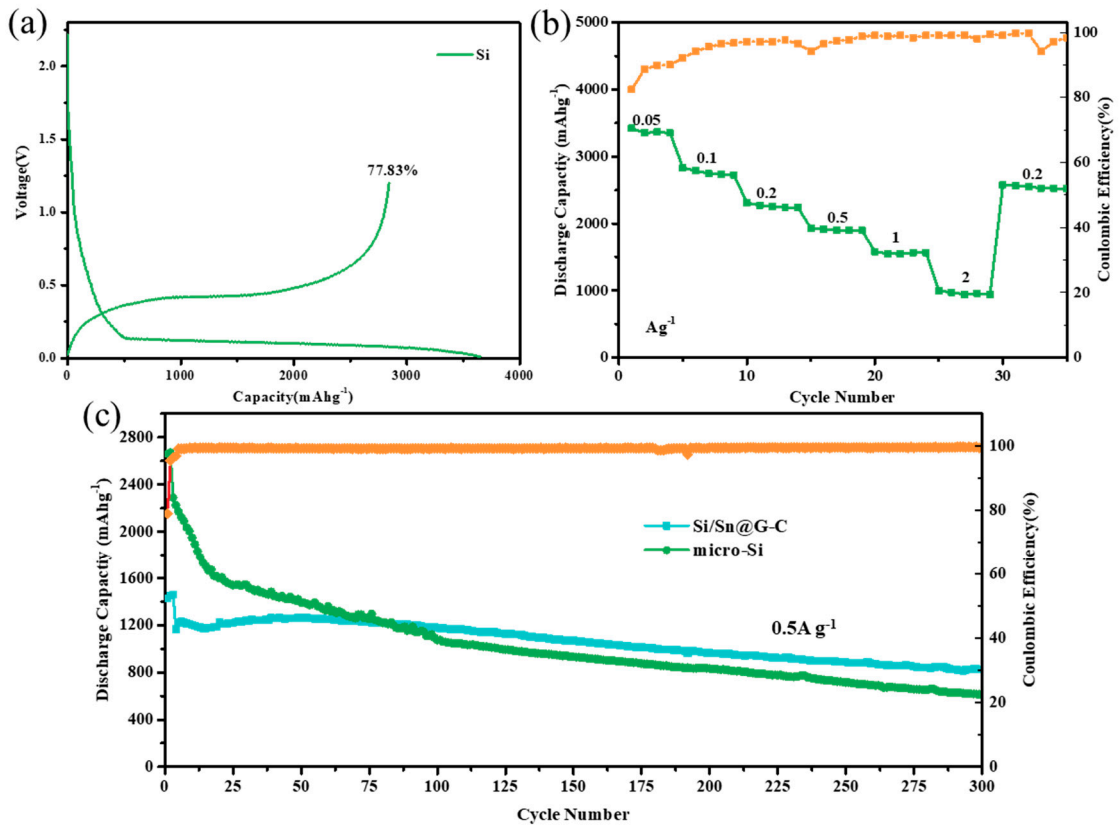

Figure S7. Electrochemical of micro sized porous Si (a) the charge/discharge profiles (b) the rate performance (c) the cycle performance

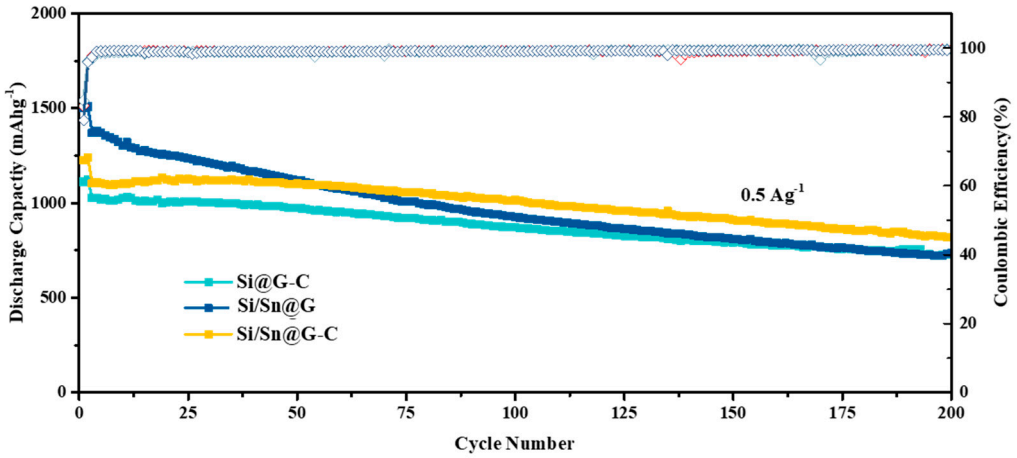

Figure S8. cycling performance at a current density of 0.5Ag^{-1} of Si/Sn@G-C, Si@G-C and Si/Sn@G anode.

References

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