

Supplementary information

Figure S1. Pathways of lithium-ion transport in two different structures

Figure S2. SEM images of the anode before and after the cycling tests for 23 cycles, in which the current density cycle is 100 mA g^{-1} for the first three cycles and 500 mA g^{-1} for the followed 20 cycles. The top-view images were shown in the left while the cross-section was laid in the right. a) and b) anode before cycling, c) and d) Si@C-1@SiO₂ after cycling. e) and f) Si@C@SiO₂ after cycling.

Figure S3. Schematic illustration of the possible structure evolutions of double core-shell Si@C-1@SiO₂ and Si@C@SiO₂ during cycling

Table S1. The comparison of the performance and preparation method between this paper and previous work

Figure S1

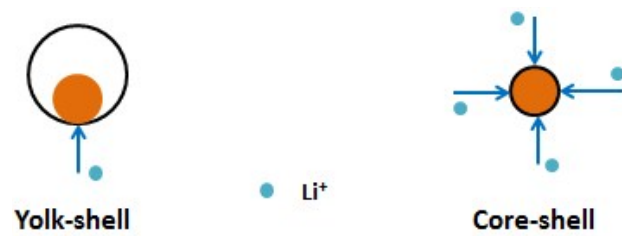


Figure S2

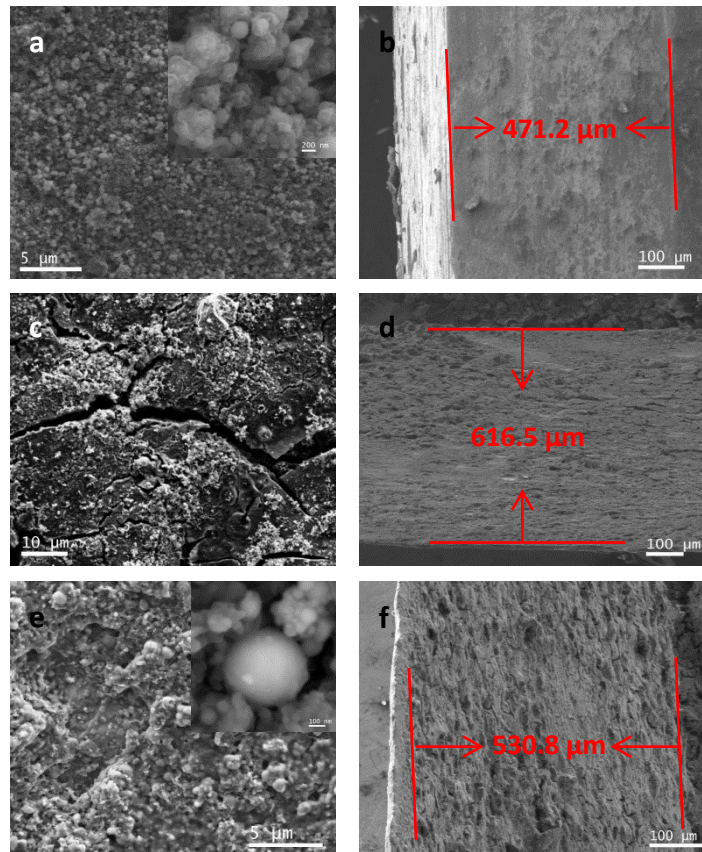


Figure S3

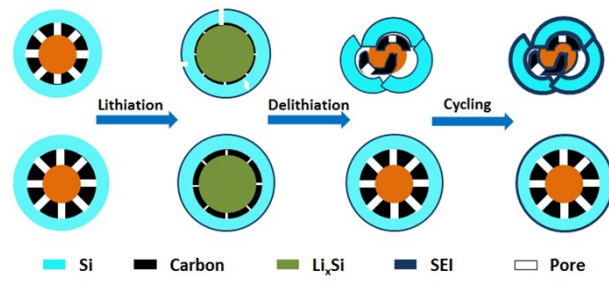


Table S1

Anode materials	Graphene preparation method	Graphene content (wt%)	Initial CE	Initial capacity	Capacity remained	Current density	Ref.
C coated Si microparticles/RGO	GO Ar/H ₂ reduced	~9.7%	91.1%	1947 mAh g ⁻¹ at 200 mA g ⁻¹	73% after 157 cycles	200 mA g ⁻¹	1
C coated Si nanoparticles/RGO	GO Ar/H ₂ reduced	—	~71%	4209 mAh g ⁻¹ at 200 mA g ⁻¹	~38.1% after 350 cycles	2 A g ⁻¹	2
Si nanoparticles/nanographene	CVD graphene growth	~8%	83.4%	2330 mAh g ⁻¹ at 250 mA g ⁻¹	95% after 510 cycles	500 mA g ⁻¹	3
Si nanoparticles/RGO	GO Ar/H ₂ reduced	~60%	83%	645 mAh g ⁻¹ at 50 mA g ⁻¹	98.5% after 100 cycles	50 mA g ⁻¹	4
2D Ag coated Si nanoparticles/RGO	GO N ₂ reduced	~10%	70%	2419 mAh g ⁻¹ at 100 mA g ⁻¹	70.2% after 100 cycles	1 A g ⁻¹	5
Microsized porous silicon/graphenen	GO aluminum reduced	~80%	80.96%	~3150 mAh g ⁻¹ at 1000 mA g ⁻¹	39.9% after 300 cycles	1 A g ⁻¹	6
Yolk-shell Si@RGO/a-c	GO Ar reduced	~6%	76 %	~2200 mAh g ⁻¹ at 400 mA g ⁻¹	75% after 101cycles	400 mA g ⁻¹	7
Double core-shell Si nanoparticles/RGO	GO Ar/H ₂ reduced	~8.1%	80.7%	1263 mAh g ⁻¹ at 100 mA g ⁻¹	91% after 500 cycles	500 mA g ⁻¹	This work

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