# In-situ growth amorphous carbon nanotube on silicon particles as lithium-ion battery anode materials

**Tingkai Zhao**
Xin Zhao

*NPU-NCP Joint International Research Center on Advanced Nanomaterials and Defects Engineering, Shaanxi Engineering Laboratory for Graphene New Carbon Materials, Northwestern Polytechnical University, Xi'an 710072, China*

ztk-xjtu@163.com

Abstract

A novel silicon core / amorphous carbon nanotube (ACNT) shell composite that can be used as lithium-ion batteries anode material was *in-situ* synthesized in the chemical vapor deposition (CVD) growth process. The hypothesized core/shell structure was evidenced by SEM/TEM/XRD, suggesting that the ACNTs composed of carbon clusters with short-range order and long-range disorder were successfully deposited onto the surface of the silicon particles(see Figure 1). This Si/ACNT composite delivered a high capacity of 1496 mAh·g$^{-1}$ at a current density of 100 mA·g$^{-1}$, and a superior cycling stability with 80% capacity retention after 300 cycles(see Figure 2). This observed specific capacity improvement of Si/ACNT composite is likely attributed to the formed three-dimensional conductive networks between silicon particles and interwoven ACNTs in the composite.

References

[1] T.K. Zhao, Y.N. Liu, T.H. Li, X. Zhao, J. Nanosci. and Nanotechno., 10 (2010) 3873-3877.

[2] T.K. Zhao, C.L. Hou, H.Y. Zhang, R.X. Zhu, S.F. She, J.G. Wang, T.H. Li, Z.F. Liu, B.Q. Wei, Sci. Rep. 4 (2014) 5619-5619.

Figures

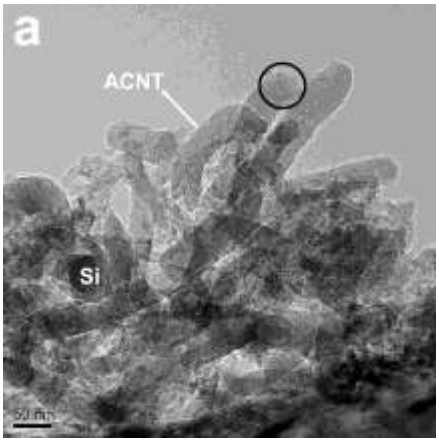


**Figure 1:** TEM image of Si/ACNT composite

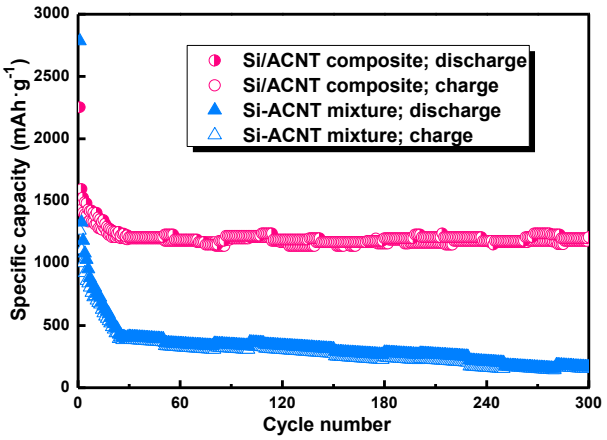


**Figure 2:** Cycling stability of Si/ACNT composite as electrode materials compared with Si-ACNT mixture at 100 mA·g$^{-1}$ for 300 cycles