

## *Electronic Supplementary Information*

### **Precise Control on the Growth of SiC Nanowires**

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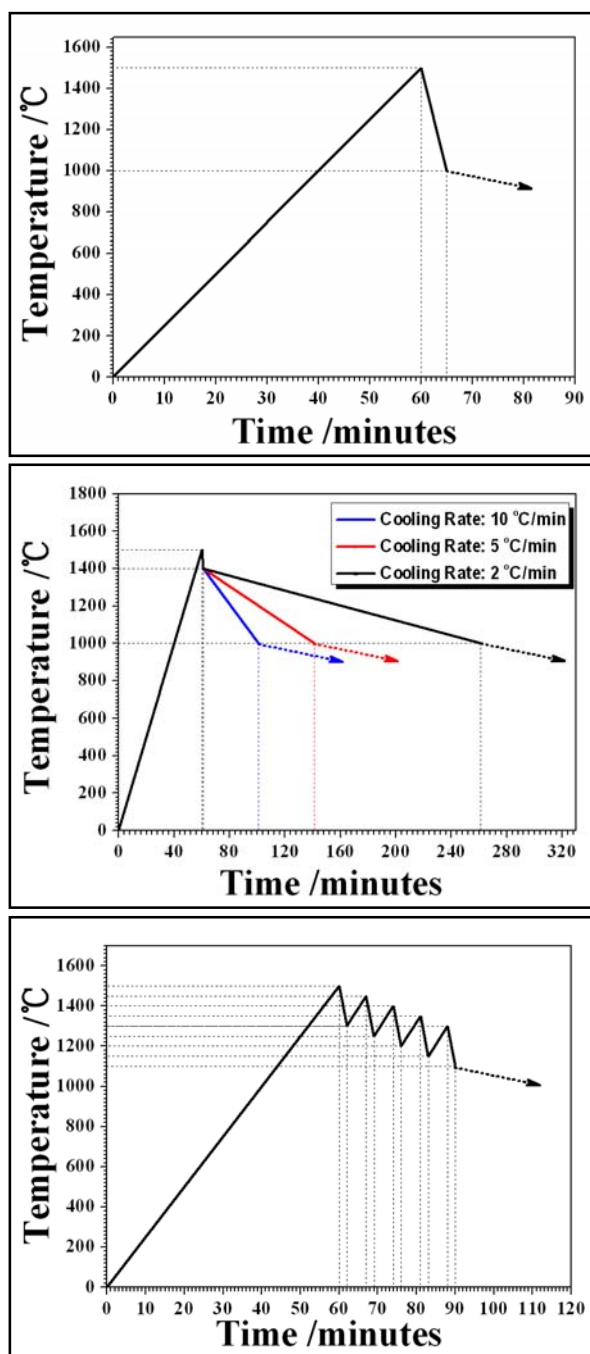
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## *Experimental Procedure*

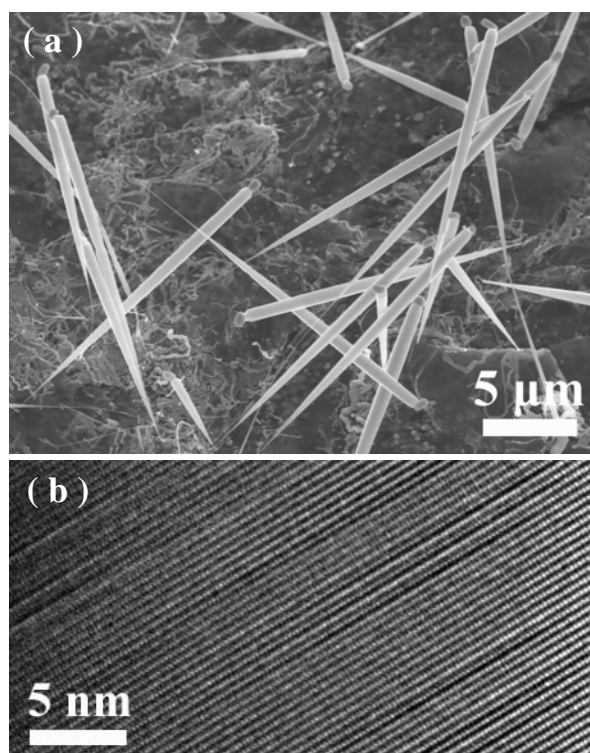
The SiC nanowires were synthesized by catalyst-assisted pyrolysis of polymeric precursor. The precursor was obtained by solidifying polyureasilazane (Ceraset, Kion Corporation, USA) at 260 °C for 30 min under Ar atmosphere, and then grounded into powders by ball milling for 8 h. ~0.3 g of the resultant powders were placed on the bottom of a high-purity alumina crucible (purity: 99%) with a graphic paper of ~2 mm thickness as a cover located at the top of the crucibles. The graphic paper was first immersed in ethanol solution of 0.2 mol/L Fe(NO<sub>3</sub>)<sub>3</sub> (99%), and then dried naturally. The crucible with the powders and graphite cover was put into a graphite-heater furnace and heated from room temperature to the desired temperature of 1500 °C in 1 h under Ar atmosphere (99.9%, 0.1Mpa), and then cooling down to 1000 °C with various cooling rates, followed by furnace cool to ambient temperature. The obtained products were characterized by using field emission scanning electron microscopy (FESEM, S-4800, Hitachi, Japan), High-resolution transmission electron microscopy (HRTEM, JEM-2010F, JEOL, Japan).

### Pyrolysis Procedure:

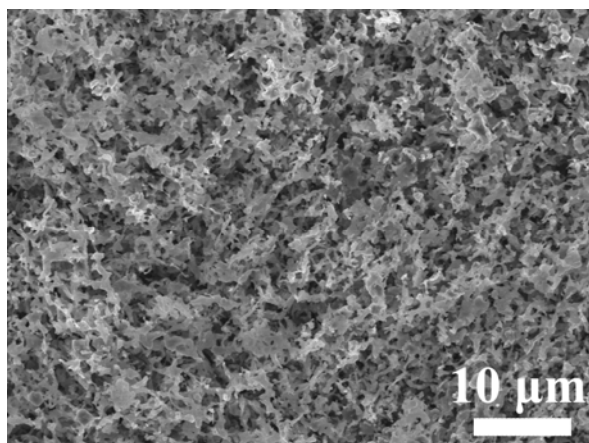


**Fig. S1.** Detailed pyrolysis schedules: (a) with a constant cooling rate of 100 °C/min; (b) with cooling rates of 10, 5 and 2 °C/min, respectively; (c) with a repeated cooling and heating process (cooling rate: 100 °C/min, heating rate: 30 °C/min).

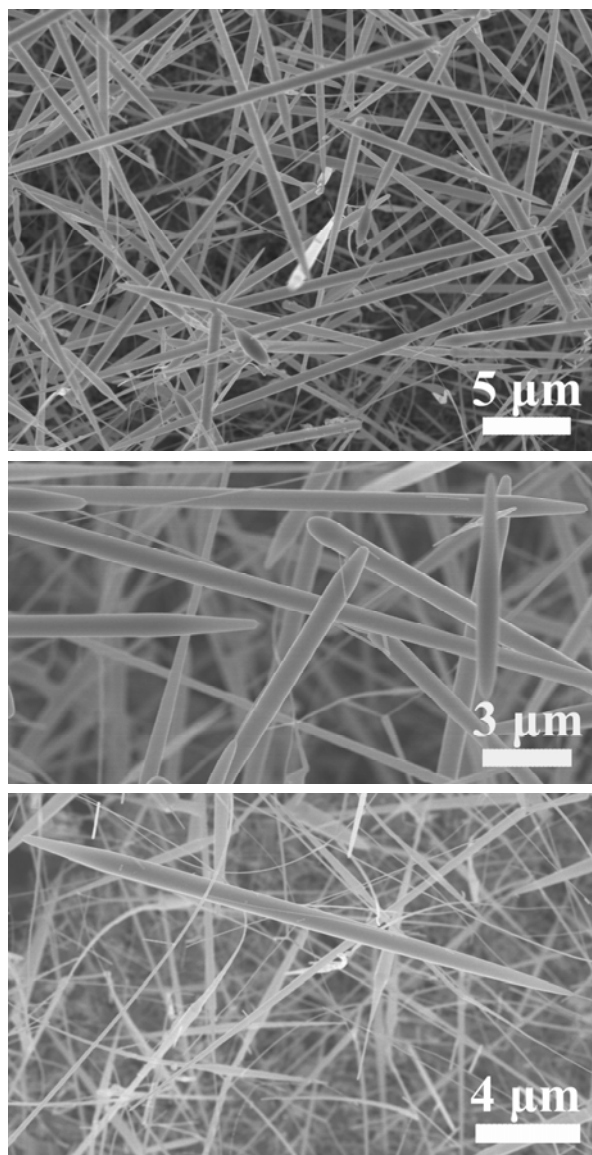
**Materials Characterization:**



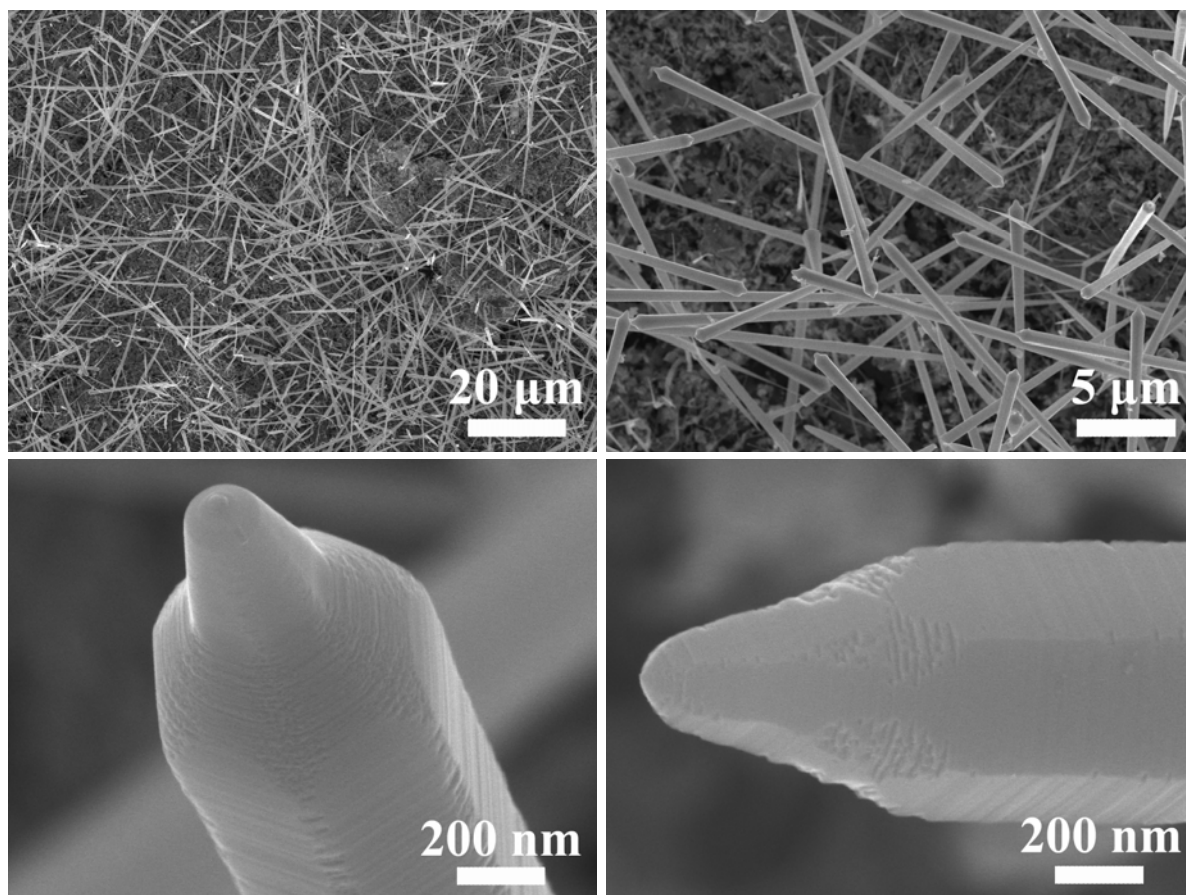
**Fig. S2.** (a) A typical SEM image of the obtained SiC nanowire with a constant cooling rate of 100 °C/min under a low magnification. (b) A typical HRTEM image of the nanowires, suggesting the existence of the defects such as stacking faults within the structures.



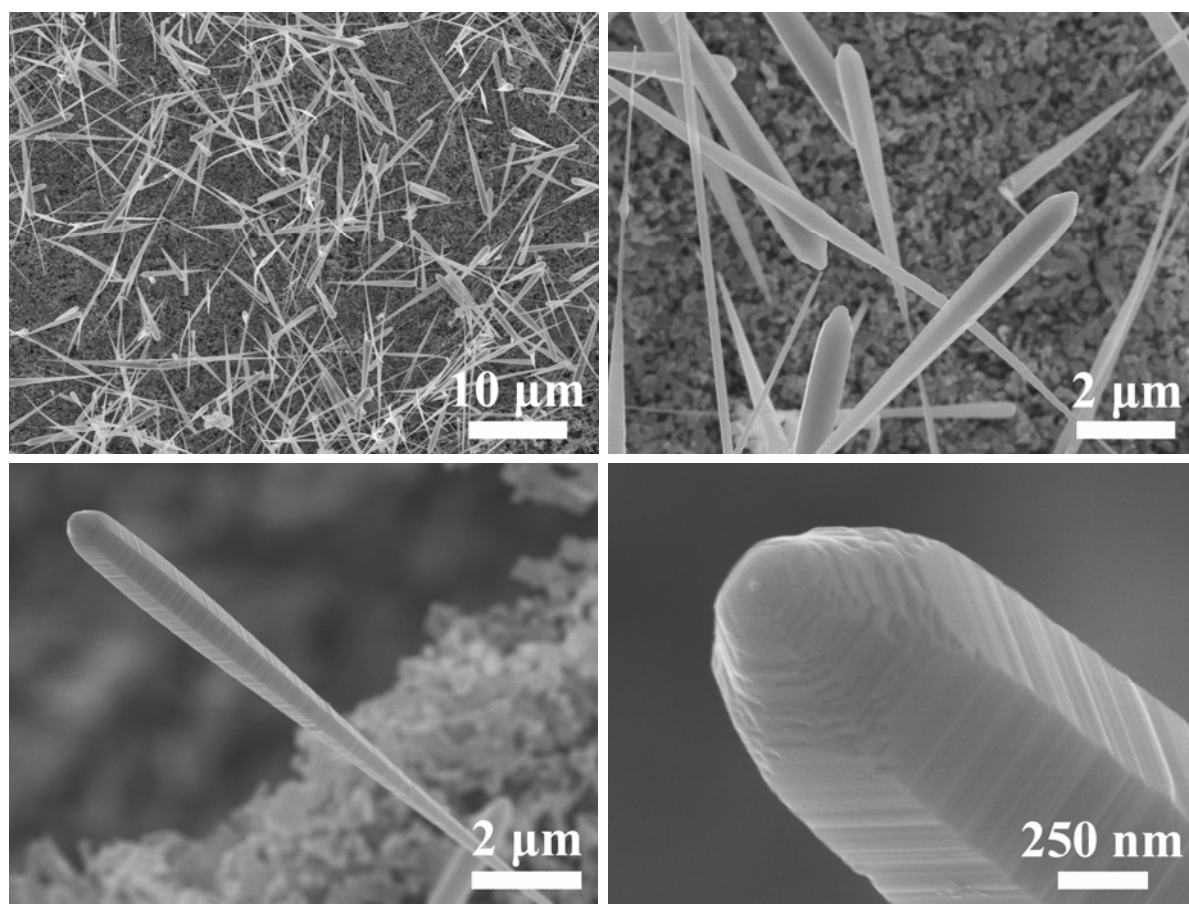
**Fig. S3.** A typical SEM image of the products with a long annealing time of 300 min and other similar experimental parameters for the fabrication of SiC nanowires in Fig.1. Little SiC nanowires can be grown, suggesting that the growth of SiC nanowires can only take place during the cooling process rather than during heating and dwelling process.



**Fig. S4.** Typical SEM images of the grown SiC nanowires with a cooling rate of 10 °C/min under different magnifications.

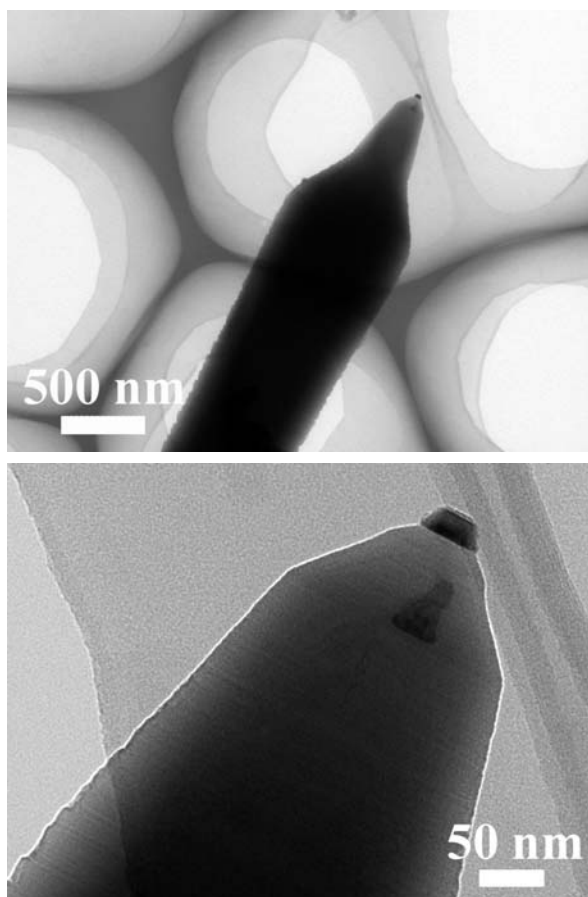


**Fig. S5.** Typical SEM images of the synthesized SiC nanowires with a cooling rate of 5 °C/min under different magnifications.

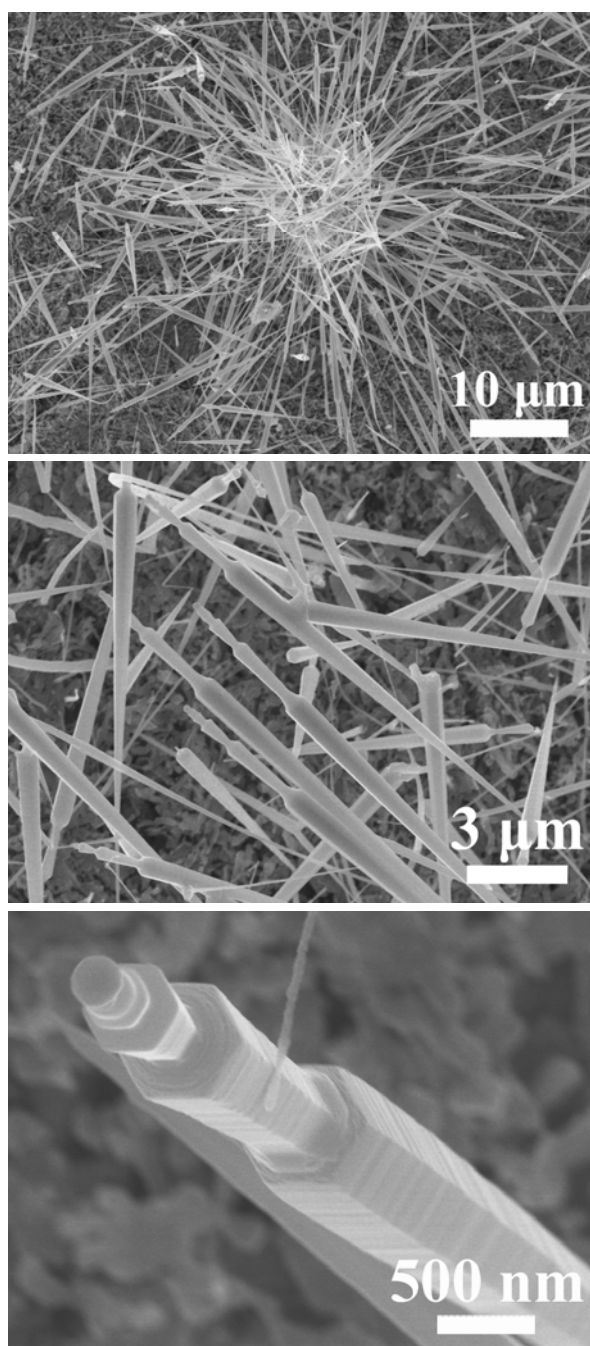


**Fig. S6.** Typical SEM images of the resultant SiC nanowires with a cooling rate of 2 °C/min under different magnifications.





**Fig. S7.** Typical TEM images of the synthesized SiC nanowire with a cooling rate of 5 °C/min under different magnifications, suggesting the catalytic droplet sized in ~50 nm on the top of nanowires.



**Fig. S8.** Typical SEM images of the obtained SiC nanowires with a repeated cooling and heating process (cooling rate: 100 °C/min, heating rate: 30 °C/min) under different magnifications.