

Supporting Information for

## Direct Growth of Graphene on Silicon by Metal-Free Chemical Vapor Deposition

Lixuan Tai<sup>1,3,#</sup>, Daming Zhu<sup>1,#,\*</sup>, Xing Liu<sup>1,2,#</sup>, Tieying Yang<sup>1</sup>, Lei Wang<sup>1</sup>, Rui Wang<sup>1</sup>, Sheng Jiang<sup>1</sup>, Zhenhua Chen<sup>1</sup>, Zhongmin Xu<sup>1</sup>, Xiaolong Li<sup>1,\*</sup>

<sup>1</sup>Shanghai Synchrotron Radiation Facility, Shanghai Institute of Applied Physics, Chinese Academy of Sciences, Shanghai 201204, People's Republic of China

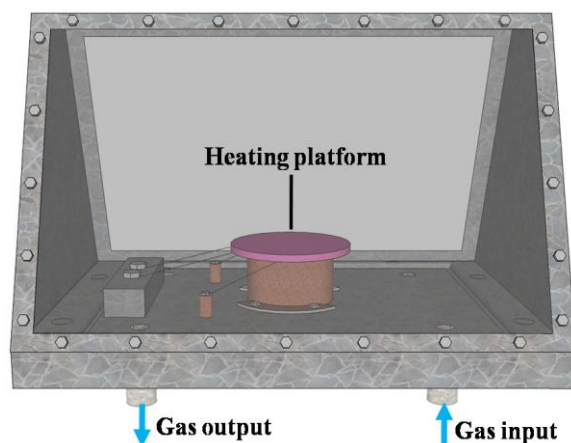
<sup>2</sup>University of Chinese Academy of Sciences, Beijing 100049, People's Republic of China

<sup>3</sup>Department of Electronic Engineering, Tsinghua University, Beijing 100084, People's Republic of China

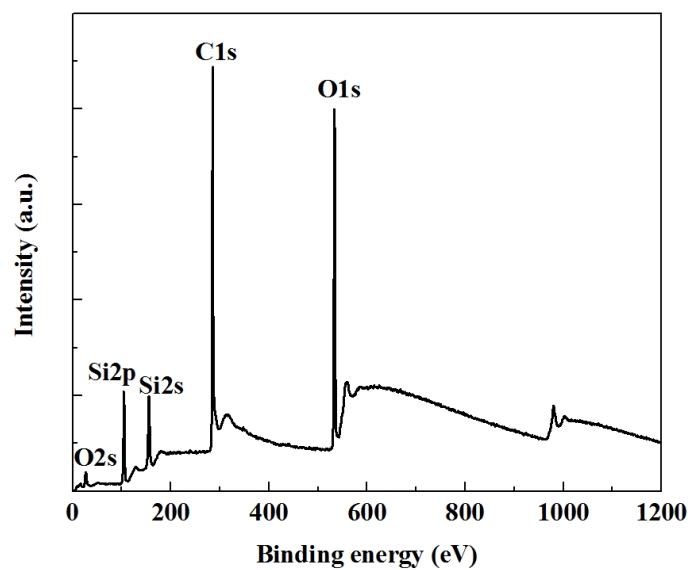
#These authors contributed equally to this work.

\*Corresponding authors. E-mail: zhudaming@sinap.ac.cn, lixiaolong@sinap.ac.cn

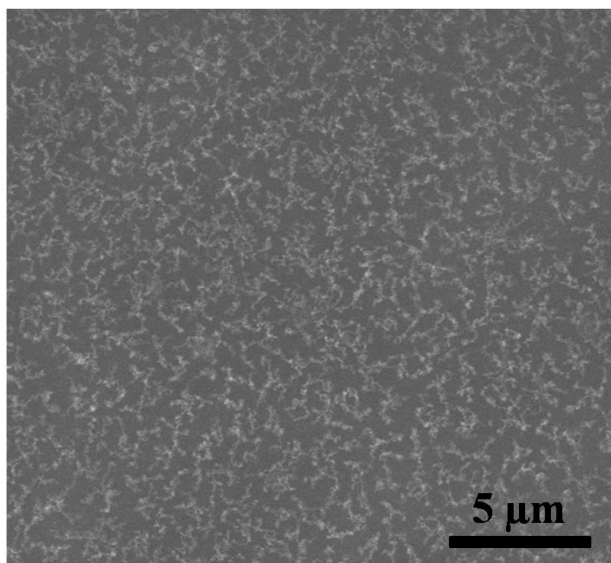
### Figures



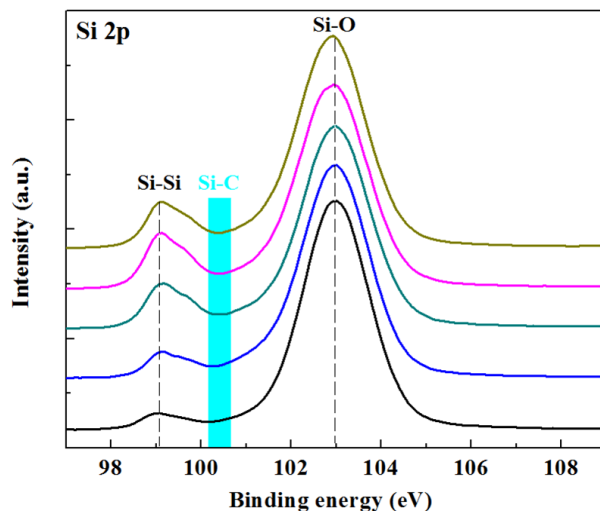
**Fig. S1** Sketch of the chemical vapor deposition (CVD) chamber. A well sealed cold-wall CVD chamber with a dedicated built-in heating platform was used for graphene growth



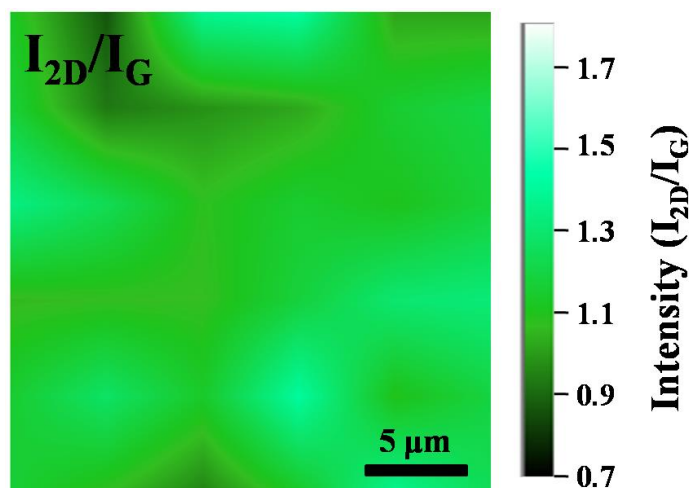
**Fig. S2** XPS full scan of the as-grown sample



**Fig. S3** SEM image of silicon surface after CVD growth at 950 °C. The flat surface of silicon has been destroyed



**Fig. S4** Si 2p XPS line scan spectra of graphene growth at 935 °C. The interval between every point on the line is 40  $\mu\text{m}$



**Fig. S5** Raman mapping of the intensity ratio ( $I_{2D}/I_G$ ) for the sample growth at 905 °C. The laser-spot size was about 2  $\mu\text{m}$  with a 473 nm wavelength. The Raman mapping of  $I_{2D}/I_G$  over large areas displays uniform distribution (mainly range from 0.9-1.4), implying that the sample is mainly composed of single layer or bilayer graphene domains, consistent with the AFM characterizations.