## Supporting Information

N<sub>2</sub> Gas Adsorption sites of Single-Walled Carbon Nanotube Bundles: Identifying Interstitial Channels at Very Low Relative Pressure

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Figure S1. Schematic drawing of gas adsorption sites to CNT bundle; four sites depicted in the cross-section of CNT bundle.



Figure S2. Schematic drawing of the physical, structural parameters and the analytical methods for the CNT bundles in this study.



Figure S3. (a) TGA and DTG curves, (b) weight losses at 500°C, and (c) catalyst residues at 800°C for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S4. (a) CNT diameter distributions from TEM images and (b) CNT bundle width distributions from SEM images for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S5. Statistical analysis of CNT wall numbers from TEM images for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S6. Raman spectra at the excitation wavelength of 532 nm for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C). The CNT diameters were assigned from the radial breathing modes.<sup>1</sup>



Figure S7. Mid-IR spectra for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heattreated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C), showing S11 peaks around 3800 cm<sup>-1</sup> and C-H stretch vibration mode of aliphatic compounds around 2900 cm<sup>-1</sup>. Based on the S11 peak positions, the mean diameters of the CNTs (dm) were estimated.<sup>2</sup>



Figure S8. BJH plot estimated by the N<sub>2</sub> isotherms for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S9. (a) Specific surface area  $S_{SPE}$  estimated by the  $N_2$  isotherms and (b) apparent density measured by He gas pycnometer for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S10. SF plot estimated by the  $N_2$  isotherms for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S11. N<sub>2</sub> isotherms of CNTs for as-grown (EC1.5), purified (EC1.5-P), and further heattreated ones under vacuum at 1200°C (EC1.5-P vac 1200°C) drawn by double logarithmic plots (relative pressure and volume adsorbed), showing the initial adsorption around the very low relative pressure of 10<sup>-8</sup>.



Figure S12. (a) TGA and DTG curves, (b) weight losses at 500°C, and (c) catalyst residues at 800°C for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heat-treated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C).



Figure S13. TEM and SEM images of bundled structures for as-grown CNTs (eDIPS EC2.0) and purified, further heat-treated CNTs under vacuum at 1200°C (EC2.0-P vac 1200°C).



Figure S14. Statistical analysis of (a) CNT diameters and (c) the distributions from TEM images, and (b) CNT bundle widths and (d) the distributions from SEM images for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heat-treated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C).



Figure S15. Statistical analysis of CNT wall numbers from TEM images for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heat-treated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C).



Figure S16. Raman spectra at the excitation wavelength of 532 nm for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heat-treated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C). The CNT diameters were assigned from the radial breathing modes.<sup>1</sup>



Figure S17. Mid-IR spectra for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heattreated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C), showing S11 peaks around 3400 cm<sup>-1</sup> and C-H stretch vibration mode of aliphatic compounds around 2900 cm<sup>-1</sup>. Based on the S11 peak positions, the mean diameters of the CNTs (dm) were estimated.<sup>2</sup>



Figure S18. N<sub>2</sub> isotherms of the as-grown (eDIPS EC2.0), purified (EC2.0-P), and further heattreated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C) at the linearly scaled relative pressure of (a) 0-1.0 and (b) 0.9-1.0.



Figure S19. BJH plot estimated by the N<sub>2</sub> isotherms for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heat-treated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C).



Figure S20. (a) Specific surface area  $S_{SPE}$  estimated by the  $N_2$  isotherms and (b) apparent density measured by He gas pycnometer for the as-grown (eDIPS EC2.0), purified (EC 2.0-P), further heat-treated CNTs under vacuum at 1200°C (EC 2.0-P vac 1200°C).



Figure S21. SF plot estimated by the  $N_2$  isotherms for the as-grown (eDIPS EC1.5), purified (EC 1.5-P), further heat-treated CNTs under vacuum at 1200°C (EC 1.5-P vac 1200°C).



Figure S22. N<sub>2</sub> isotherms of as-grown (eDIPS EC2.0), purified (EC2.0-P), and further heattreated CNTs under vacuum at 1200°C (EC2.0-P vac 1200°C) at the logarithmically scaled relative pressure, and the zoom at the extremely low relative pressure.

## Reference

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