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# Supporting information for

# In-situ fabrication of depth-type hierarchical CNT/quartz fiber filters for high efficiency filtration of sub-micron aerosols and high water repellency

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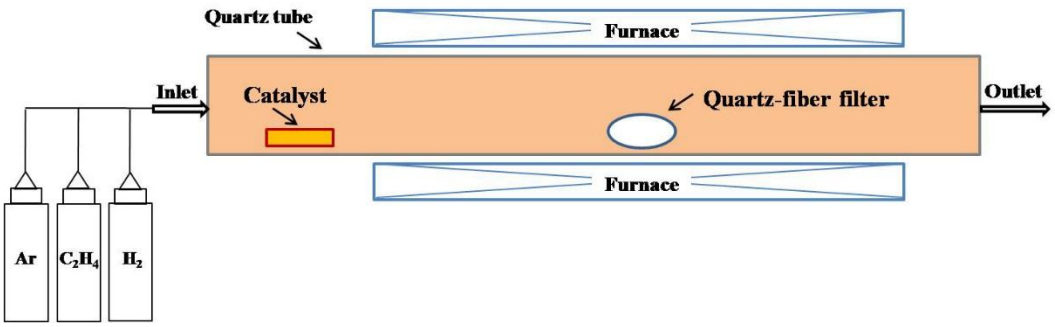


Figure S1: The schematic of the synthesis process of CNT/quartz fiber filter.

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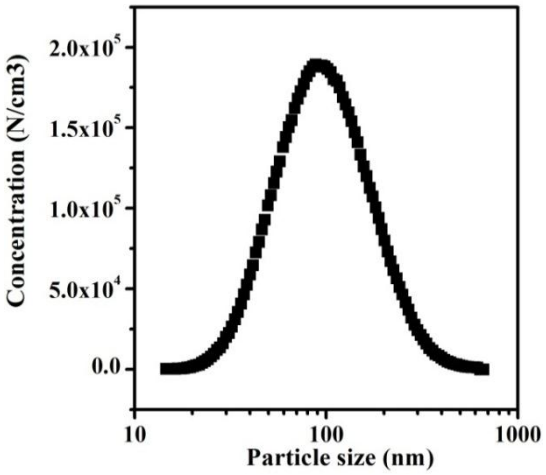


Figure S2: Typical size distribution of atomized polydisperse NaCl aerosols used for air filtration test.

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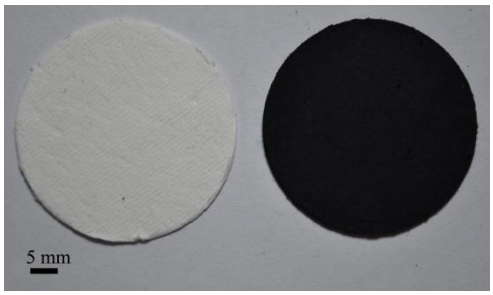


Figure S3：Images of a quartz fiber filter (left) and a CNT/quartz fiber filter (right).

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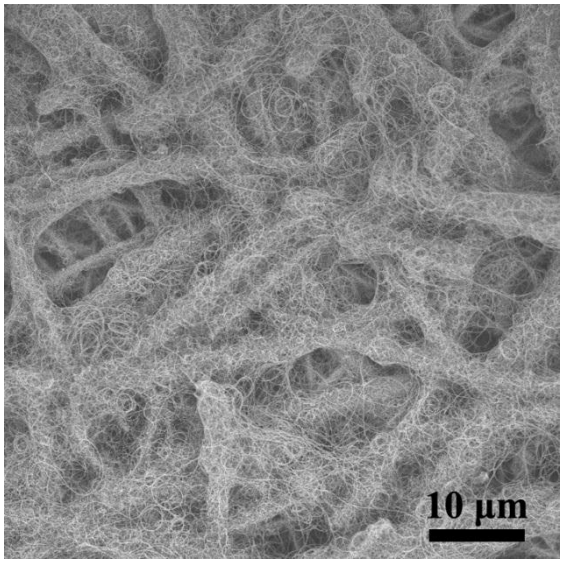


Figure S4: SEM image of a CNT/quartz fiber filter after 5 minutes of sonication in ethanol.

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1. **Calculation of porosity:** porosity is calculated as following

$$\text{Porosity} = \frac{\rho_{quartz\ fiber} - \rho_{quartz\ fiber\ filter}}{\rho_{quartz\ fiber} - \rho_{air}} \quad (1)$$

ρ stands for the density of materials, and the ρ of quartz fiber, CVD growth CNTs and air is 2.2 g/cm$^3$, 2[1] g/cm$^3$ and 1.2 × 10$^{-3}$ g/cm$^3$ respectively. Therefore, the porosity of quartz fiber filter can be calculated to be 89.1%. To calculate the porosity of CNT/quartz fiber filter, the $\rho_{quartz\ fiber}$ and $\rho_{quartz\ fiber\ filter}$ in formula (1) can be replaced by $\rho_{quartz\ fiber-CNTs}$ and $\rho_{CNT/quartz\ fiber\ filter}$ respectively. Based on TGA results, the $\rho_{quartz\ fiber-CNTs}$ can be calculated as following:

$$\rho_{quartz\ fiber-CNTs} = 2.2 \times 0.87 + 2 \times 0.13 = 2.17 \quad (2)$$

Thus, the porosity of CNT/quartz fiber filter can be calculated to be 89.4%.

2. **Calculation of filter specific area:** filter specific area is calculated as following

Filter specific area = BET surface area × Density

## Reference

[1] Zhang Q, Huang J Q, Zhao M Q, et al. Carbon Nanotube Mass Production: Principles and Processes. ChemSusChem, 2011,4(7):864-889.