Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Electronic Supplementary Information

Selective Sorting Metallic/Semiconducting Single-walled Carbon Nanotube Arrays by 'Igniter-assisted Gas-phase Etching'

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S1: Stability of non-adsorbed SWNTs under etching condition.

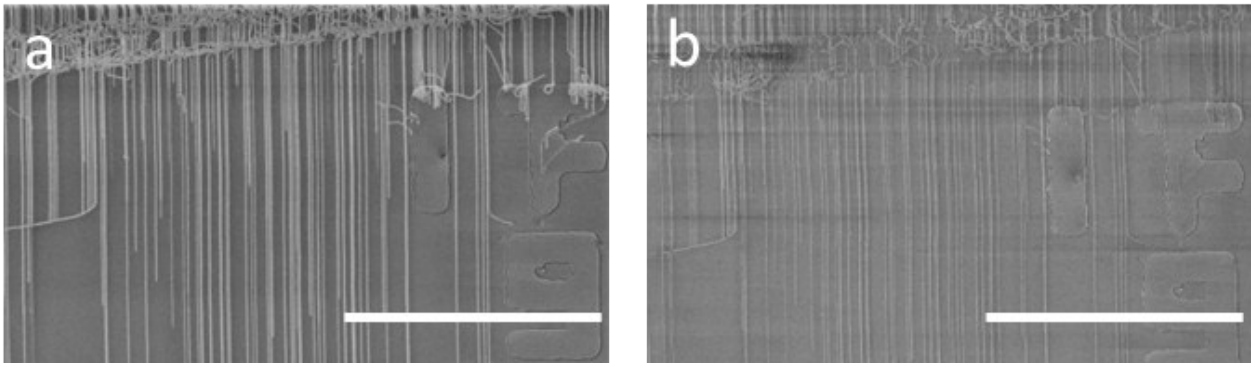

Figure S1. SEM images of as-grown samples at the same position before (a) and after (b) a 480°C etching process for 10 minutes. The density of array did not have a significant decrease, which proved the stability on pristine SWNTs under the etching condition. Scale bar: 30 μm。

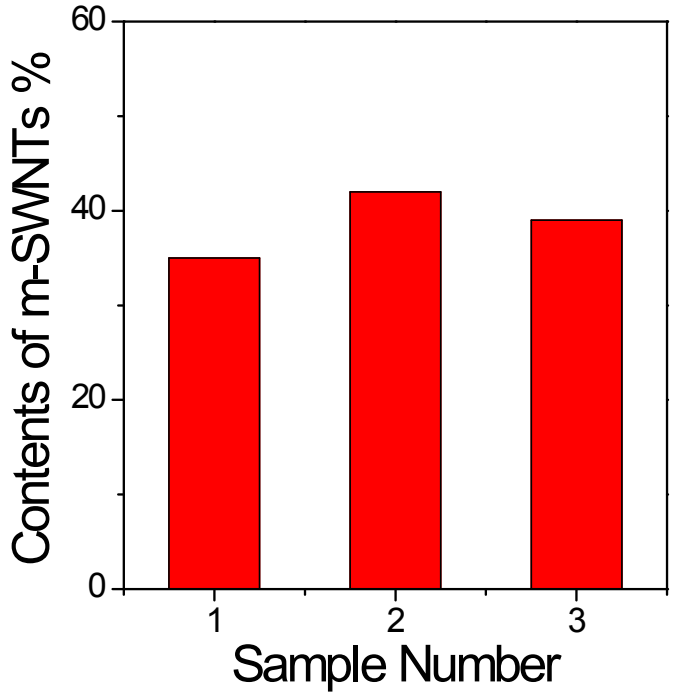

Figure S2. Statistics of the m-SWNT contents of different samples statistics from the line mapping of Raman spectra. No. 1 referred to as-grown SWNT arrays without any treatment, No. 2 referred to SWNT arrays immersed in pure water for 12 hours and No. 3 referred to SWNT arrays immersed in toluene for 12 hours. From the experiment we could exclude the influence from the solvent.

S2: Quantitative analysis of the SDS adsorbing capacity on SWNTs.

The linear density of carbon atoms $\bar{\rho}_c$ could be calculated as

$$\bar{\rho}_c = \frac{\pi \bar{d} N}{S_c}$$

In which $\bar{d}$ referred to the average diameter of SWNTs, N referred to the number of atom in a unit cell of graphene and S_c referred to the area of a unit cell. Considering that the average diameter in our sample is 1.7 nm, we can get $\bar{\rho}_c \approx 205\ C \cdot nm^{-1}$. **Figure S3** showed the analysis of SDS adsorbing capacity on SWNTs.

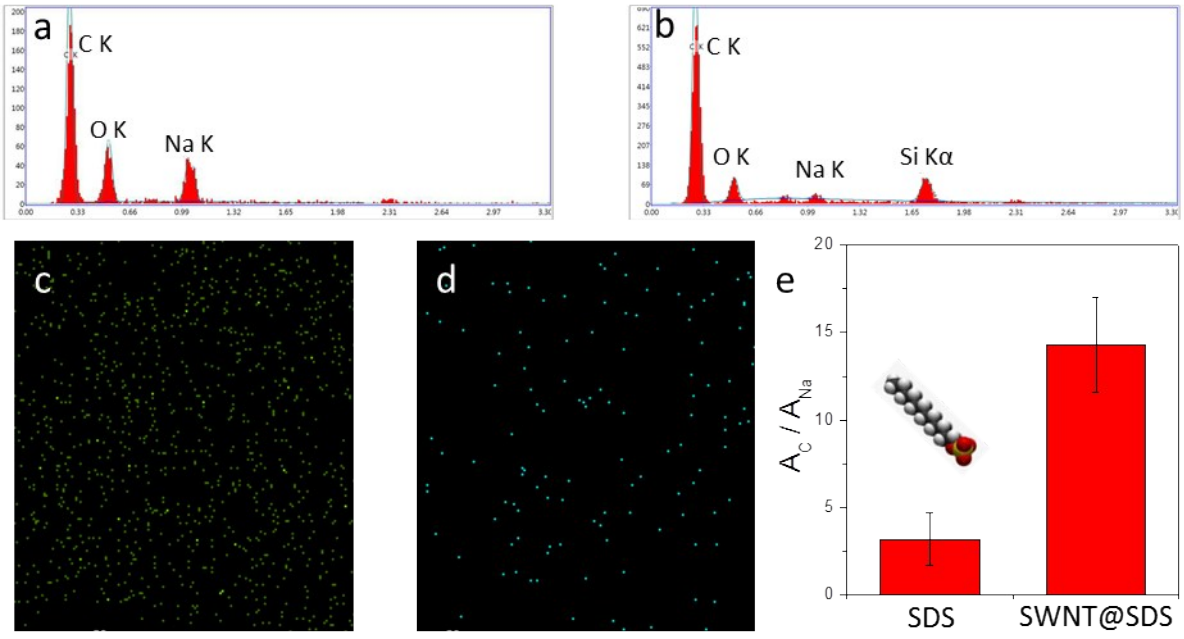

Figure S3. Quantitative analysis of the adsorbing capacity. a-b) EDX spectra for pure SDS (a) and SWNT samples covered by SDS. c-d) EDX mapping of carbon (c) and sodium (d) element. e) the peak area ratio between pure SDS and SWNT @ SDS. A_C and A_{Na} referred to the peak area of carbon and sodium respectively.

We could calculate from Tab. S1 that the atom number ratio of carbon to sodium is 53.6, which means that in average, one SDS could adsorbed on 41.6 carbon atoms on an SWNT. As only one third of the SWNTs are metallic ones which could adsorbed SDS, the adsorbing capacity should be 14.7 SDS per

nanometer.

Table S1 Quantitative analysis of the adsorbing capacity

	N_C / N_{Na}	A_C / A_{Na}
SDS	12	3.2
SWNT@SDS	53.6	14.3

S3: Etching selectivity assisted by 4HP with different heating process.

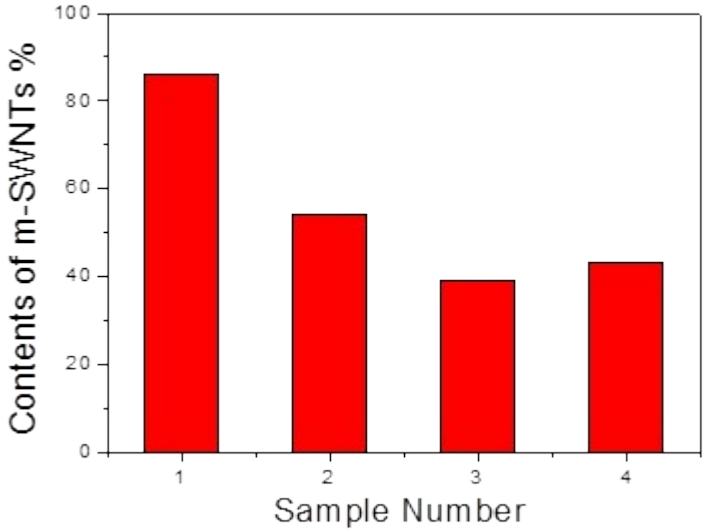

Figure S4. Statistics of the m-SWNT contents with different heating process under the same etching condition using 4HP igniter. No. 1-3 referred to the direct heating in the air from room temperature in 1min, 10 min and 20 min. No. 4 referred to the sample annealed at 300^{o}C for 10 minutes SWNT arrays after absorption process minutes in protection, and then heated to 480^{o}C in the air in 1 min.