Supporting Information

Preparation of defected SWCNTs decorated with en-APTAS for application to high performance nitric oxide gas detection

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S1. Gas sensing measurement system.

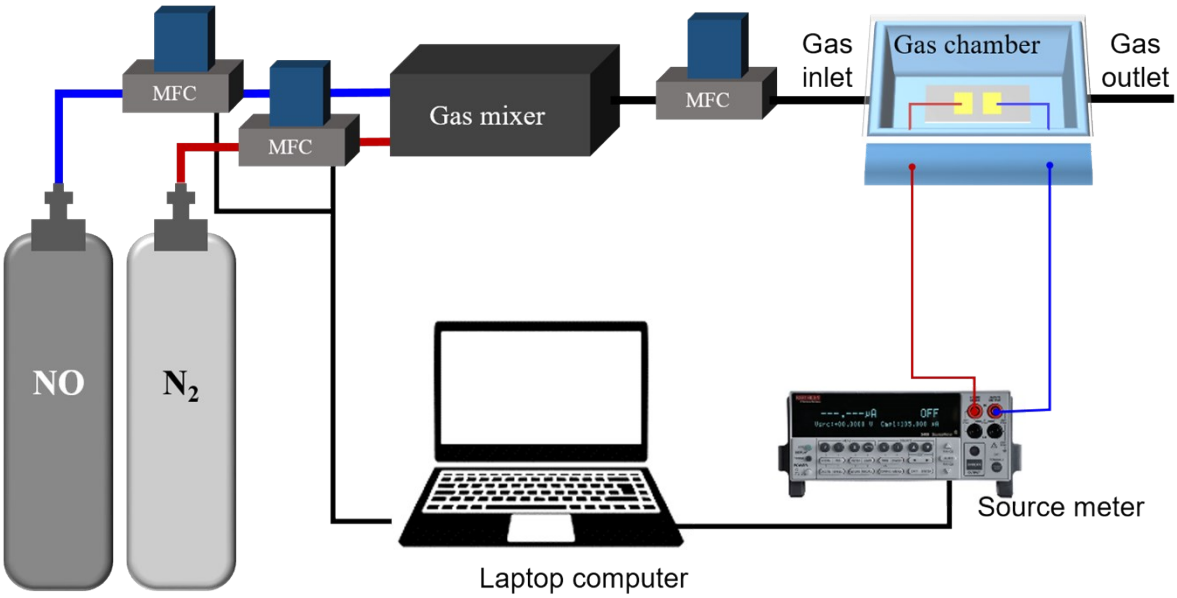

Fig. S1 Schematic of the measurement system for chemiresistive-type gas sensing device.

S2. Comparison of SEM images; effect of APTES SAM treatment.

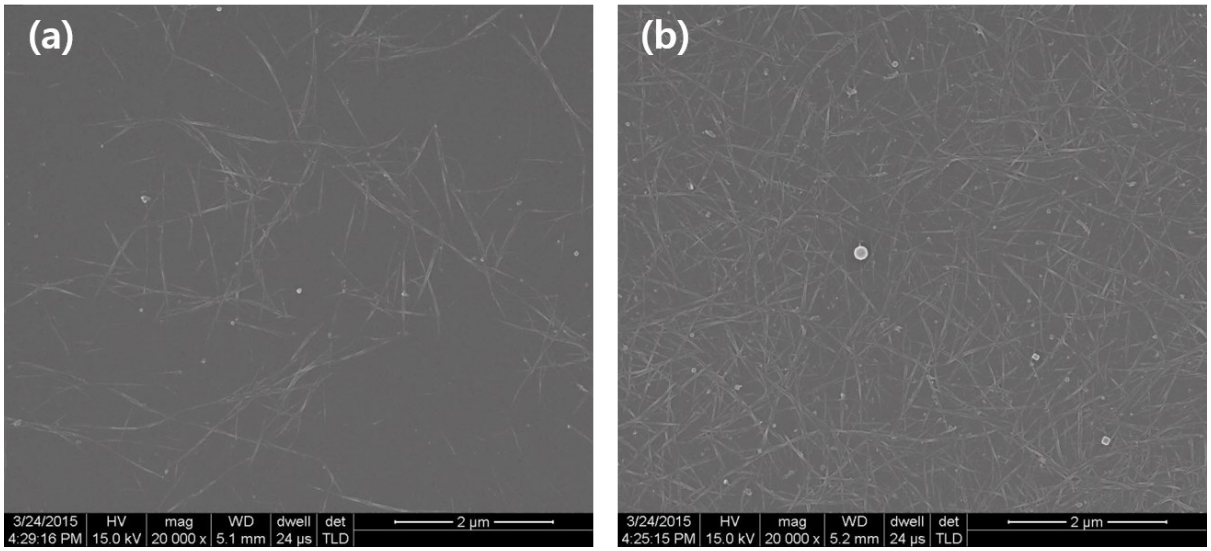

Fig. S2 SEM images of the SWCNT networks on a SiO_2/Si substrate **(a)** w/o and **(b)** with APTES SAM treatment.

To confirm the effect of APTES SAM treatment, we prepared cleaned SiO_2/Si substrates, *i.e.,* (i) as-prepared, and (ii) APTES SAM-treated. On each substrate, the SWCNT suspension was identically spray-coated as described in the manuscript, followed by IPA-rinsing. From Fig. S2, more SWCNTs were adsorbed on the APTES SAM-treated SiO_2/Si substrate **(b)** than the bare SiO_2/Si substrate **(a)**, and hence, demonstrating the effect of APTES SAM treatment.

S3. Variation in response (%) values of successive 100 ppb NO sensing curves.

Response (%) \ Peak no.	1	2	3	4	5
pristine SWCNTs	7.35	6.32	2.92	1.64	1.32
en-APTAS-decorated SWCNTs	28.17	29.22	14.65	8.97	6.82

S4. Ethanol-rinsing effect on the recovery performance.

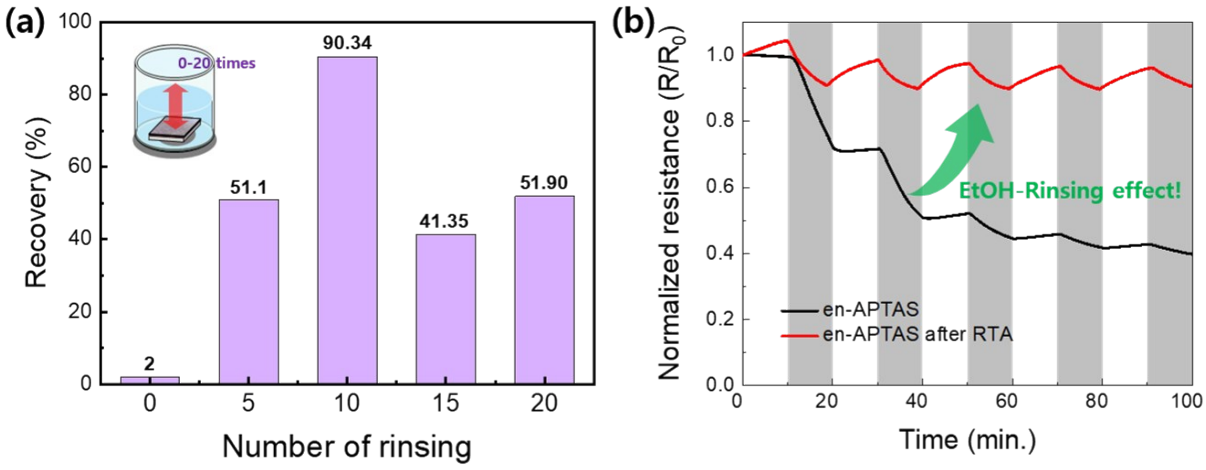

Fig. S3 Recovery variation depending on the number of ethanol rinsing. **(a)** Plot of the recovery (%) *versus* the number of rinsing. **(b)** Variation in normalized resistance (R/R_0) on time.

We assumed that the poor recovery performance of the sensing device was owing to the effect of impurities in the channel area *(e.g.*, unbound en-APTAS molecules, etc.). To confirm this, we prepared a gas sensing device with SWCNTs decorated with en-APTAS molecules, followed by different numbers of rinsing as 0, 5, 10, 15, and 20. The recovery performance of the device changed depending on the number of rinses, and the sample that was rinsed 10 times showed the highest recovery value (90.34%), as shown in Fig. S3(a). In Fig. S3(b), the time-resolved normalized resistance curves of the samples before and after ethanol rinsing are compared. These data clearly demonstrate the ethanol-rinsing effect on the recovery enhancement.

S5. Long-term stability test.

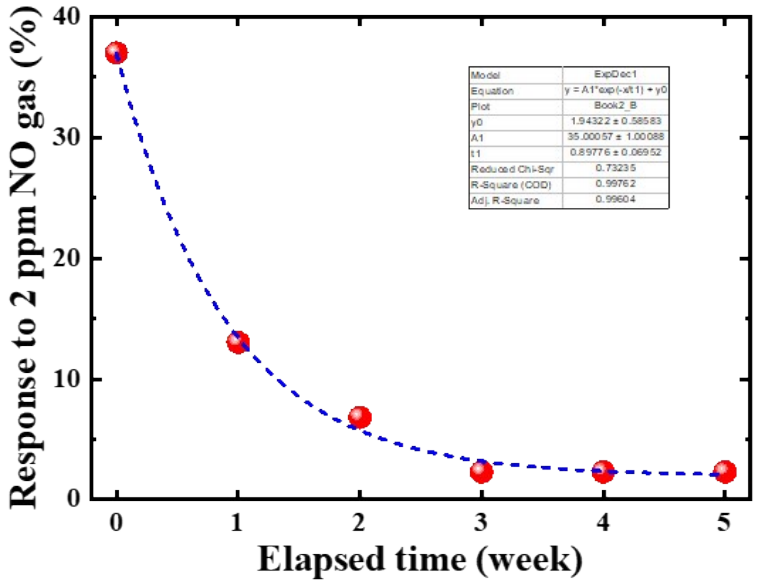

Fig. S4 Long-term stability test; variation of response values with the elapsed time.

To evaluate the long-term stability, the en-APTAS functionalized defected SWCNTs based NO sensor had been measured weekly for five weeks. During the period, the device had been kept in ambient air. Fig. S4 shows the time-dependent variation of the response values which is well-fitted with the exponentially decaying curve. The response value had been decayed each time, reaching to 2.3 % (~6 % of the first measured value of 37 %) after five weeks. The significant deterioration of performance is due to the interaction between en-APTAS and water molecules (*i.e.*, acid-base reaction) [1-3]. However, the mentioned reaction is reversible, therefore the device can be returned to its initial performance by heating [4].

References in *Supporting Information*

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[4] M. W. G. Hoffmann, J. D. Prades, L. Mayrhofer, F. Hernandez-Ramirez, T. T. Jarvi, M. Moseler, A. Waag and H. Shen, *Adv. Funct. Mater.*, 2014, **24**, 595-602.