Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

One-step synthesis of mesoporous Al_2O_3-In_2O_3 nanofibres with remarkable gas-sensing performance to NO_x at room temperature

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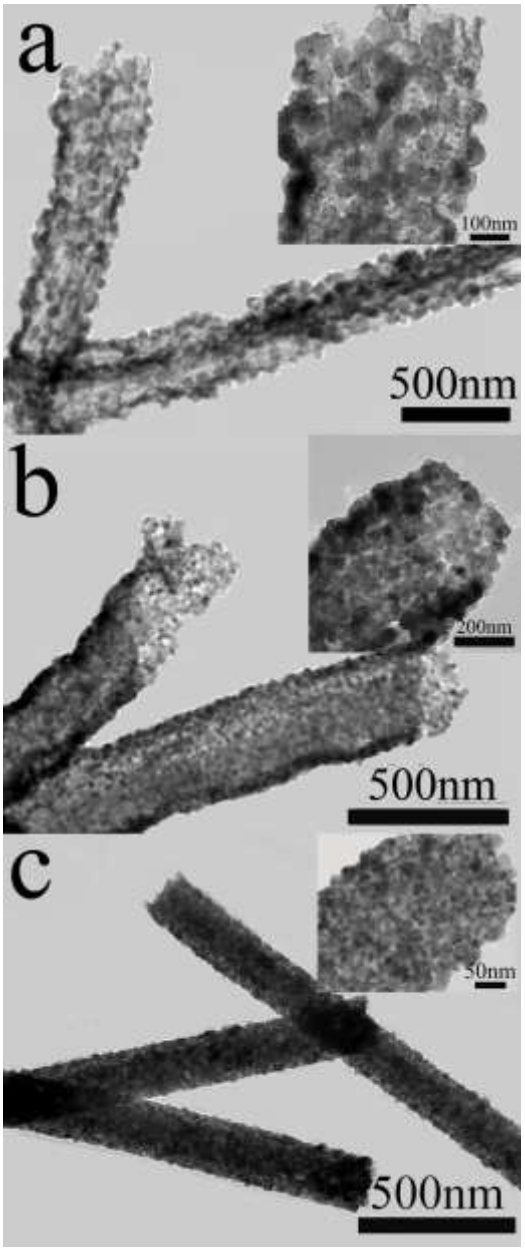

Fig. S1 TEM images of Al_2O_3-In_2O_3 composited NFs with different atomic ratios

(a) Pure In_2O_3 NTs, (b) Meso-15AI NTs, (c) Meso-25AI NRs.

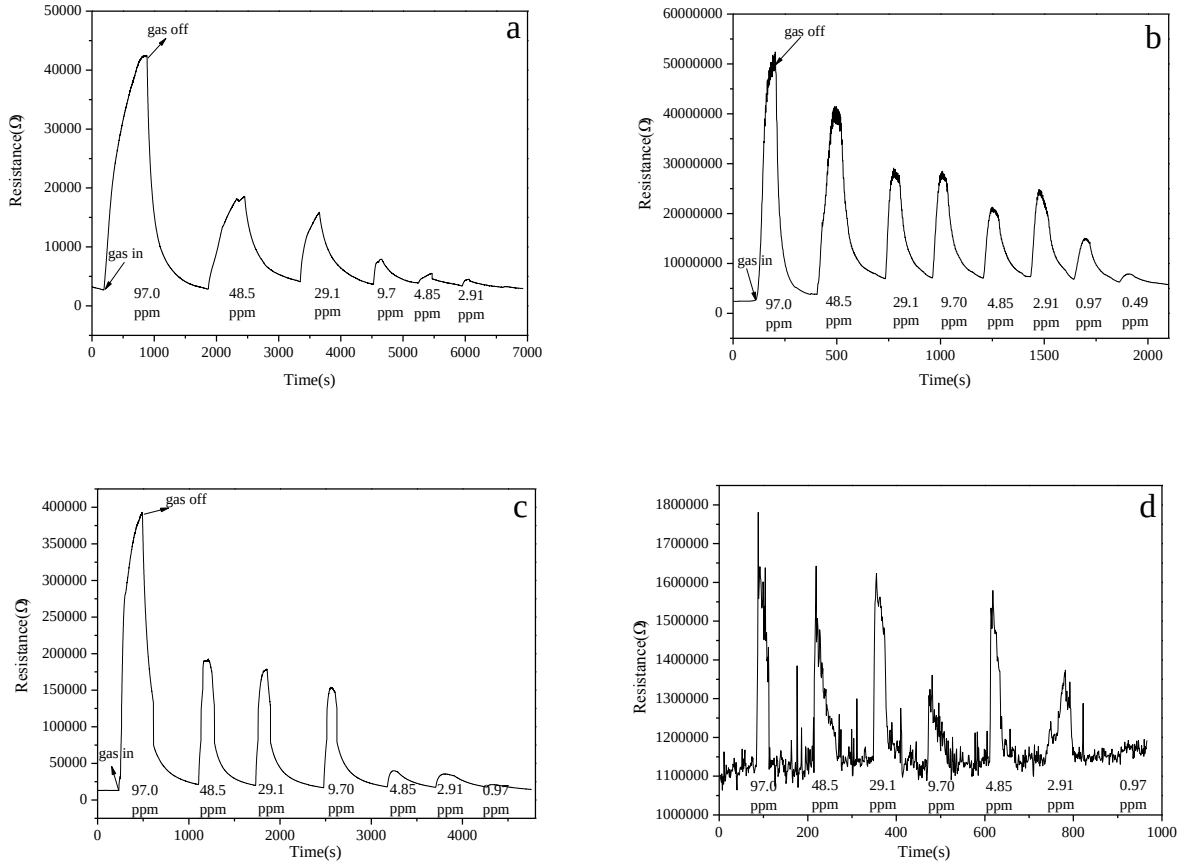

Fig. S2 Dynamic response-recovery curves of Al_2O_3-In_2O_3 composites NFs thin film sensors with different atomic ratios to 0.49-97 ppm NO_x at room temperature (RT) in air. (a) Pure In_2O_3 NTs, (b) Meso-15AI NTs, (c) Meso-25AI NRs, (d) Porous pure Al_2O_3 NRs (RH: 42%).

Table S1a Comparison of the response-recovery results of (A) response and (B) response time of mesoporous Al_2O_3-In_2O_3 composited NFs thin film sensor with different atomic ratios to NO_x (RH: 42 %)

(A)

Volume concentration (ppm)		97.0	48.5	29.1	9.70	4.85	2.91	0.97	0.49	0.29
Response	Pure In_2O_3 NTs	13.7	5.57	2.83	1.22	0.38	0.30	-	-	-
	Meso-15AI NTs	18.3	9.97	3.18	2.97	2.02	2.33	1.11	0.23	-
	Meso-20AI NTs	100	24.9	9.57	11.6	7.49	5.17	5.86	2.84	0.74
	Meso-25AI NRs	29.1	8.90	7.94	8.12	1.18	1.04	0.13	-	-
	Porous pure Al_2O_3 NRs	0.46	0.39	0.42	0.18	0.39	0.20	0.03	-	-

(B)

Volume concentration (ppm)		97.0	48.5	29.1	9.70	4.85	2.91	0.97	0.49	0.29
Response time (s)	Pure In_2O_3 NTs	247	211	118	96	97	25	-	-	-
	Meso-15AI NTs	32	23	16	18	17	17	21	24	-
	Meso-20AI NTs	28	9	10	29	16	13	7	21	24
	Meso-25AI NRs	56	29	28	30	19	25	14	-	-
	Porous pure Al_2O_3 NRs	2	6	3	5	2	25	18	-	-

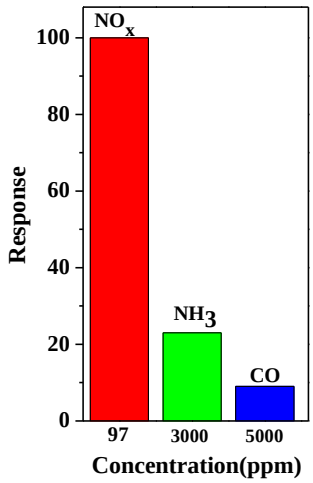

Fig. S3 The meso-20AI NTs thin film sensor with response to various gases at RT in air (RH: 42 %)

The selectivity of the meso-20AI NTs thin film sensor had been tested at different concentrations of various gases, such as, NH_3, CO and H_2. As shown in Fig. S3, the thin film sensor shows the highest response to NO_x with a value of up to 100 for 97 ppm, while for 3000 ppm NH_3 gases, the response is about 23, while for 5000 ppm CO, the response is only 9, and there is no response even H_2 of 10000 ppm at RT. One can conclude that the meso-20AI NTs sensor shows an obvious selectivity and that they have the highest gas response to NO_x, implying a good NO_x sensor.

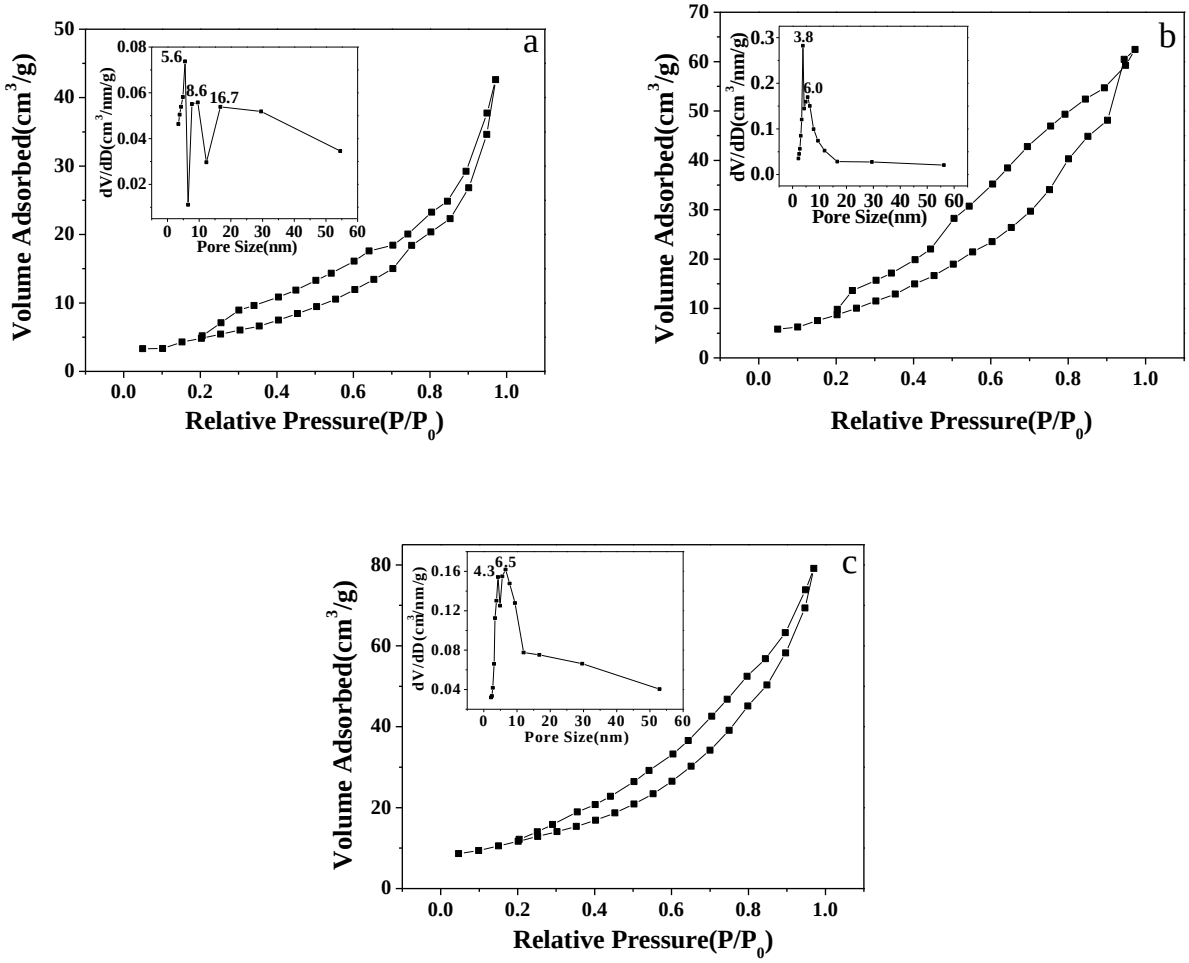

Fig. S4 Typical N_2 adsorption-desorption isotherm and pore-size distribution curve (inset) of the mesoporous Al_2O_3-In_2O_3composited NFs with different atomic ratios.

(a) Pure In_2O_3 NTs, (b) Meso-15AI NTs, (c) Meso-25AI NRs.

For above the three samples i.e. the pure In_2O_3 NTs, the content of Al_2O_3-composited at 15 at% (meso-15AI NTs) and 25 at% (meso-25AI NRs), the BET specific surface is about 21.1, 37.4 and 44.1 m^2 g^{-1} respectively. The specific surface of the synthesized samples decreased in the order of meso-25AI NRs > meso-15AI NTs > pure In_2O_3 NTs .

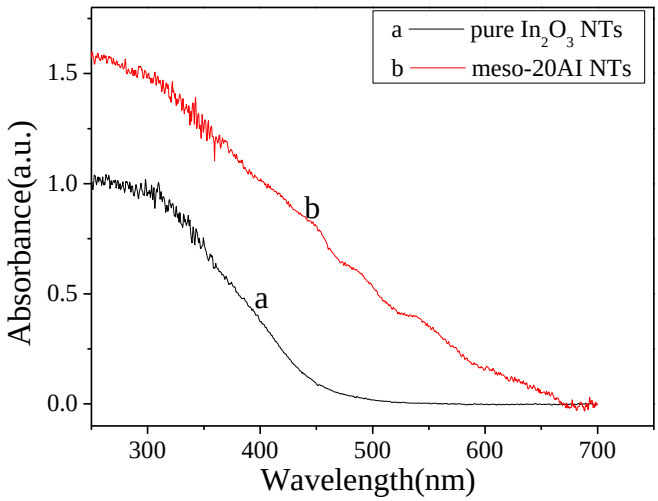

Fig. S5 UV-vis diffuse absorption spectra of Al_2O_3-In_2O_3 composites NTs with different atomic ratios. (a) Pure In_2O_3 NTs, (b) Meso-20AI NTs

Reference

[1] M. C. Long, W. M. Cai, J. Cai, B. X. Zhou, X. Y. Chai, Y. H. Wu. *J. Phys. Chem. B* 2006, *110*, 20211-20216.