Mesoporous In_2O_3 nanocrystals: synthesis, characterization and NO_x gas sensor at room temperature

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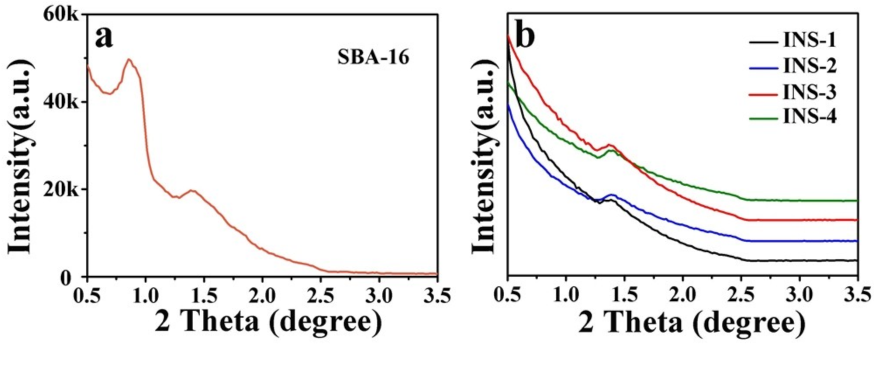

Fig. S1 Low-angle XRD X-ray diffraction diagrams of SBA-16 (1) and mesoporous In_2O_3 materials replicated from mesoporous silica of INS-1, INS-2, INS-3, INS-4. respectively.

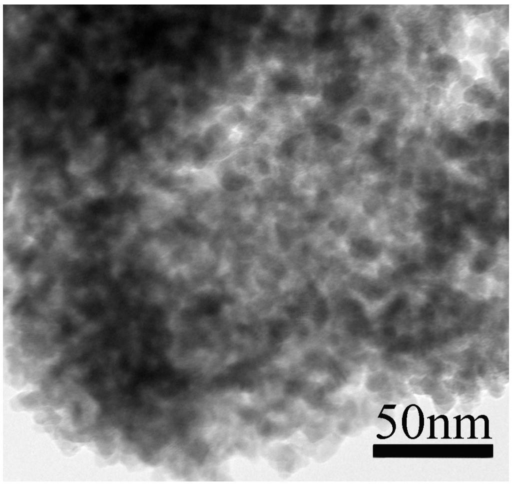

Fig. S2 TEM image of the INS-2.

Fig.S2 exhibited INS-2 sample was composed of In_2O_3 nanoparticles (5~10 nm) with some mesopores.

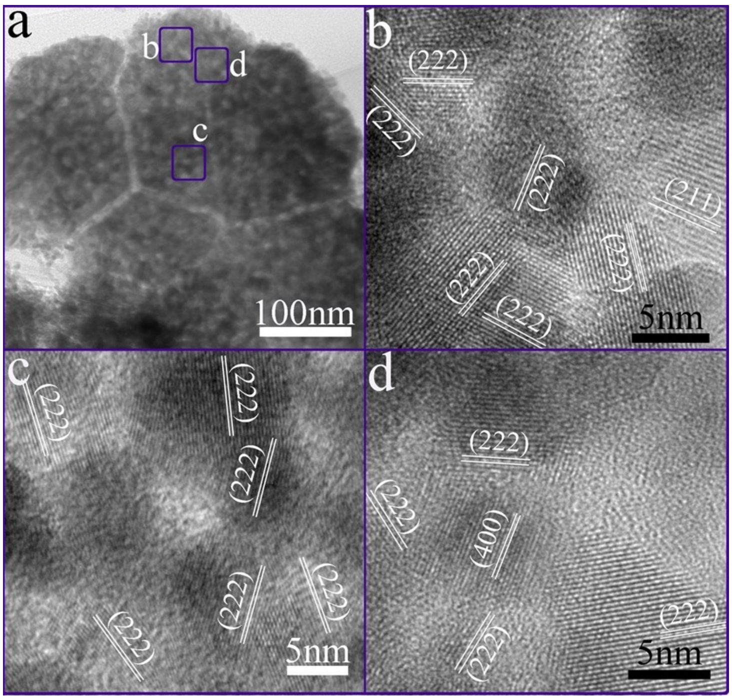

Fig. S3 TEM/HRTEM images of the INS-3. (a) TEM image, (b-d) HRTEM images of (a) INS-3.

Table S1 Comparison of the response-recovery results of response and response time(s) with different samples to NO_x (RH: 42%)

Volume concentration /ppm		97.0	48.5	29.1	9.70	4.85	2.91	0.97
INS-1	Response	9.74	3.81	3.42	2.7	0.53		-
	Response time/s	105	131	56	167	35		-
INS-2	Response	41.2	17.7	13.5	5.36	1.58	1.19	1.2
	Response time/s	196	276	409	450	409	323	165
INS-3	Response	158.7	50.7	36.8	19.7	12.6	7.2	1.9
	Response time/s	87	65	206	131	48	49	45
INS-4	Response	7.39	6.9	5.84	4.4	0.76	-	-
	Response time/s	267	200	257	333	89.3	-	-

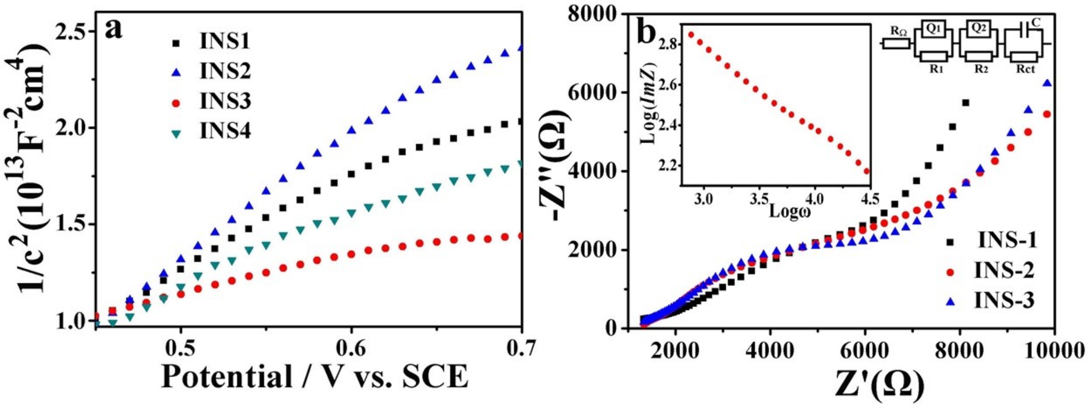

Fig. S4 (a) The Mott-Schottky curves of INS-1, INS-2, INS-3 and INS-4 samples, (b) The EIS curves of INS-1, INS-2 and INS-3 samples. The right inset is the corresponding equivalent circuit model, the inset in left shows the logarithmic plot of the imaginary part of the impedance.

Here R_{Ω} indicates the uncompensated bulk resistance of the electrolyte, separator and electrode. The Q1R1 parallel element corresponds to the electrode film interface capacitance (Q1) and the surface pore resistance (R1).[1] The Q2R2 parallel element might be attributed to the possible break down of the electrolyte and the electrode material's internal microstructures. R_{ct} is attributed to the charge-transfer resistance at the active material interface and C is the constant phase angle element, involving double layer capacitance.

Table S2 Carrier concentrations and fitted impedance parameters of the INS-1, INS-2 and INS-3.

Samples	$R_{\Omega}(\Omega)$	$R_1(\Omega)$	$R_2(\Omega)$	$R_{ct}(\Omega)$	Carrier concentration (cm^{-3})
INS-1	972.8	5.71×10^5	1987	5.67×10^4	3.7×10^{17}
INS-2	846.6	3.34×10^5	2509	4.89×10^4	2.7×10^{17}
INS-3	562.4	6639	1314	125.2	9.3×10^{17}

Notes and references

1 1 R. Sakamoto, Sh. Katagiri, H. Maeda, H. Nishihara, *Coordination Chemistry Reviews*, 2013, **257**, 1493-1506.