Supporting Information

One-step synthesis of hierarchical α-$Ni(OH)_2$ flowerlike architectures and their gas sensing properties to NO_x at room temperature

Hongjie Wang1, Jun Gao1, Zhigang Li1, Yunlong Ge1, Kan Kan1,2, Keying Shi1*

1. Key Laboratory of Functional Inorganic Material Chemistry, Ministry of Education. Key Laboratory of Physical Chemistry, School of Chemistry and Chemical Engineering, Heilongjiang University, Harbin 150080; 2. Daqing Branch, Heilongjiang Academy of Sciences, Daqing 163316, People's Republic of China.

School of Chemistry and Materials Science, Heilongjiang University, Harbin, 150080,P.R.China. Fax: Tel: +86 451 86609141; E-mail: shikeying2008@yahoo.cn (K. Y. Shi).

Table S1 The data of FT-IR spectrum for the α-$Ni(OH)_2$

wavenumber cm^{-1}	3646	3499	2958, 2927, 2856,	2226	1600	1460	1393, 1287, 1172	1130, 1037, 1009	833	640	483
functional group	-OH	OH---H_2O	$-CH_3$, $-CH_2$ (DBS^-)	C≡N (OCN^- or CNO^-)	C=C (benzene)	CO_3^{2-}	NO_3^-	SO_4^{2-} (DBS^-)	C-H (p-substitutd benzene)	Ni-OH	Ni-O

The thermal behavior of the α-$Ni(OH)_2$ sample was investigated with TG measurements recorded at 35~600 ^oC (see Fig.S1 and Table S1). It is clear that the first stage occurs between 35~200 ^oC, and the total weight loss is measured to be 5.24~14.00 %, corresponding to the loss of the interlayer water molecules. The major weight loss occurs between 200 and 530 ^oC, and the total weight loss is measured to be 27.93~36.10 %, in agreement with the value calculated from the decomposition process of α-$Ni(OH)_2$ to NiO.

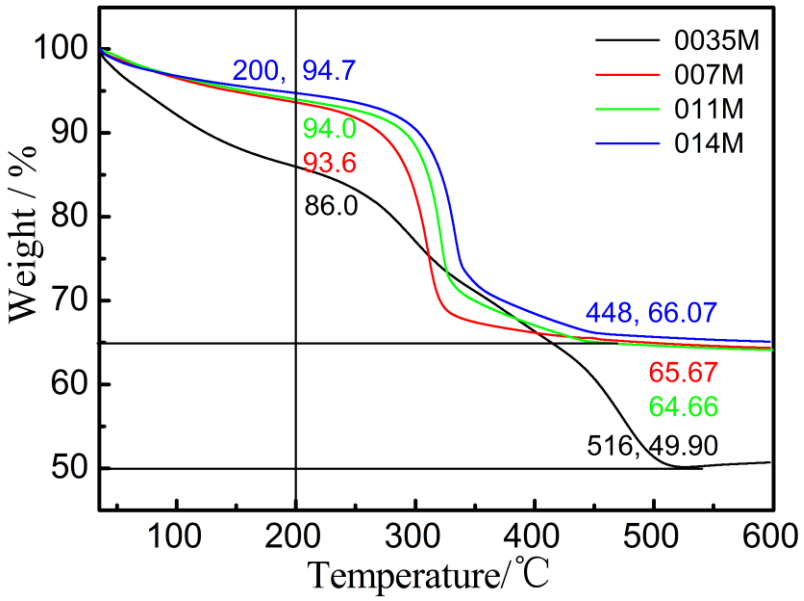

Fig. S1 TG curves of the α-$Ni(OH)_2$ samples

Table S2 TG results of synthesized samples

Samples	W(mg)	(35~200 °C) ΔW1 %	(200~530 °C) ΔW2 %	ΔW_{NiO}%
0035M	5.399	14.00	36.10	49.90
007M	4.608	6.40	27.93	65.67
011M	4.573	6.00	29.34	64.66
014M	4.426	5.24	28.67	66.07

Table S3 Elemental analysis results of the samples

Samples	W (mg)	N (Wt. %)	C (Wt. %)	H (Wt. %)	S (Wt. %)	Ni+O (Wt. %)
0035M	2.488	0.81	15.41	3.61	0.92	79.25
007M	2.167	3.13	12.28	3.19	2.38	79.02
011M	2.305	5.26	12.10	2.36	0.55	79.73
014M	2.507	3.49	11.01	2.24	1.99	81.27

Table S4 The gas response results of α-$Ni(OH)_2$ nanocrystalline film sensor to NO_x

Volume Concentration (ppm)	97	68	48.5	29.1	9.7	4.85	2.91	0.97	0.485	0.291	0.097
Sensitivity (%)	32.5	27.1	26.0	23.6	19.5	16.7	15.8	10.0	5.5	5.2	5.0
Response time (s)	16	16	13	16	15	16	15	31	31	30	47

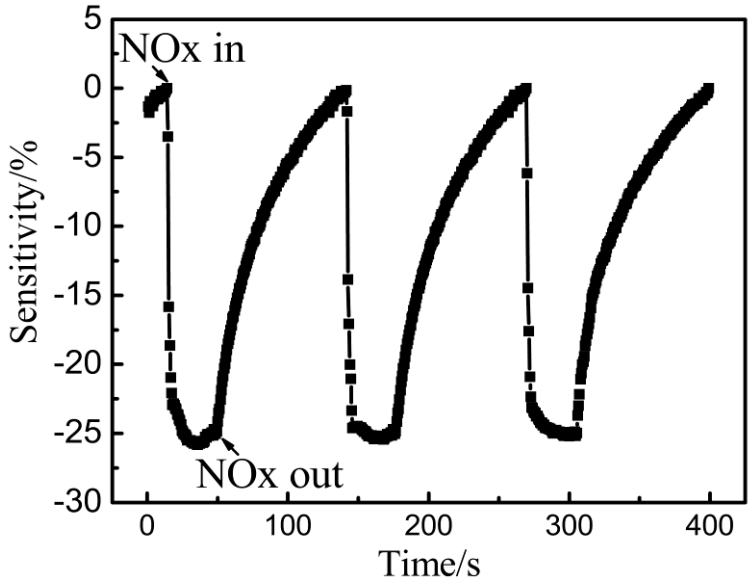

Fig. S2 Three circular of response-recovery curve of α-$Ni(OH)_2$ (fresh) film to NO_x concentration of 48.5 ppm. (sample: 007M; temperature: 20 ^oC; humidity: 40 %)

Table S5 Three circular test data of fresh α-$Ni(OH)_2$ film(sample 007M) to NO_x concentration of 48.5 ppm at 20 ^oC and humidity of 40 %

Concentration of NO_x (ppm)	48.5	48.5	48.5
Sensitivity (%)	25.8	25.2	25.2
Response time (s)	3.0	4.0	3.3
Recovery time (min)	1.6	1.6	1.6

Three cyclic curve of layered α-$Ni(OH)_2$ (fresh) film examined to 48.5 ppm NO_x gas, the corresponding data and Figure were listed in Table S5 and Fig. S2. As is depicted, the total time of three circular was 387 s, and single cycle time was just 129 s. When the α-$Ni(OH)_2$ film exposed to 48.5 ppm of NO_x, the resistance rapidly decreased to a minimum, and then tend to be stable within

three of the same cycle. Table S5 exhibited the data which evaluate gas sensitivity of the α-$Ni(OH)_2$ film within three of the same cycle in detail.

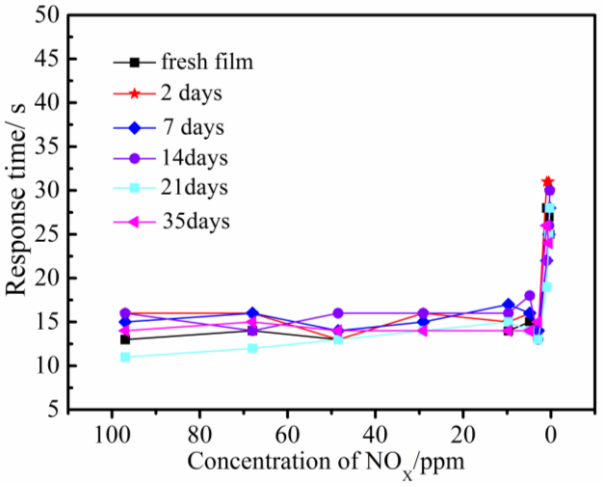

Fig. S3 Response time curves of α-$Ni(OH)_2$(007M sample) exposed to NO_x with decreasing concentrations.