Supporting Information

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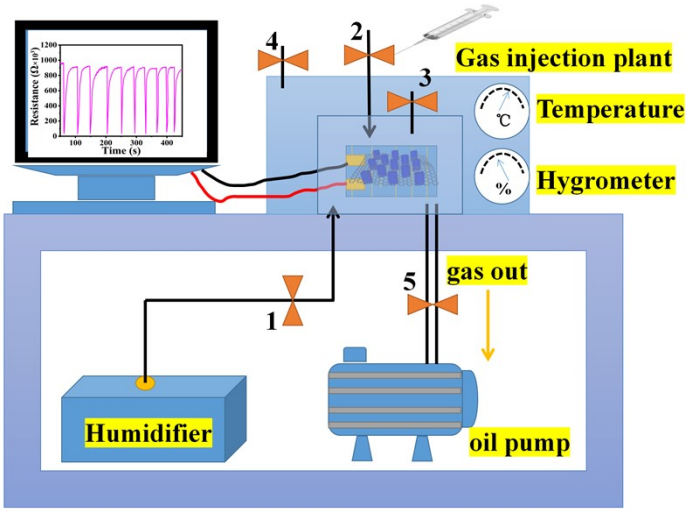

Fig.S1 Self-assembled gas sensor diagram

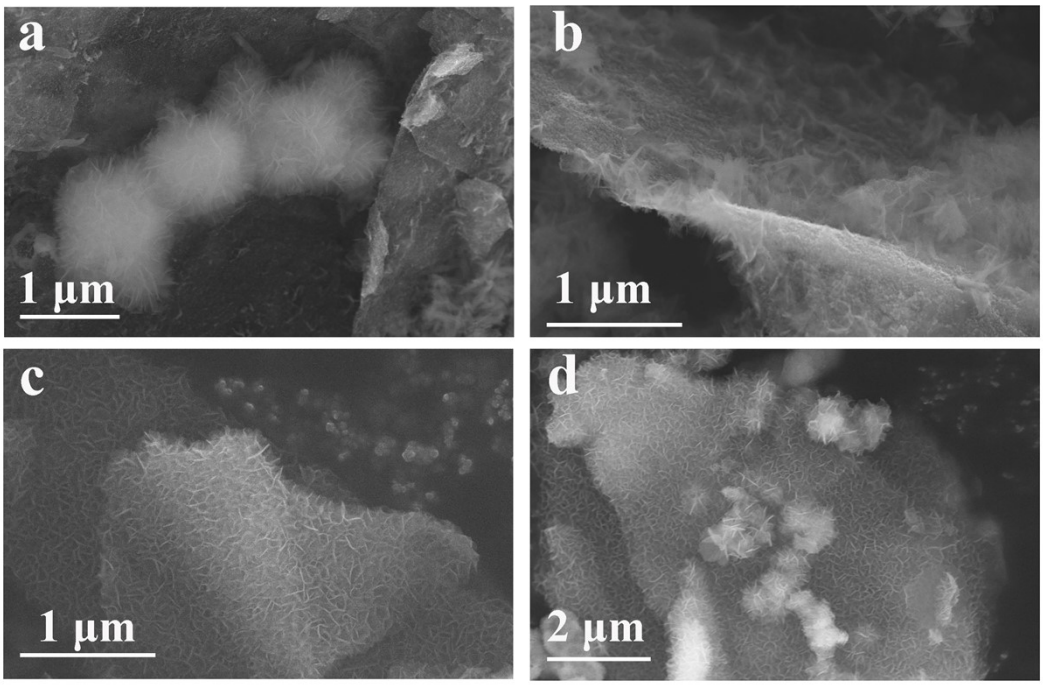

Fig.S2 SEM images of NF/rGOz;NF/rGO1; NF/rGO2; NF/rGO3

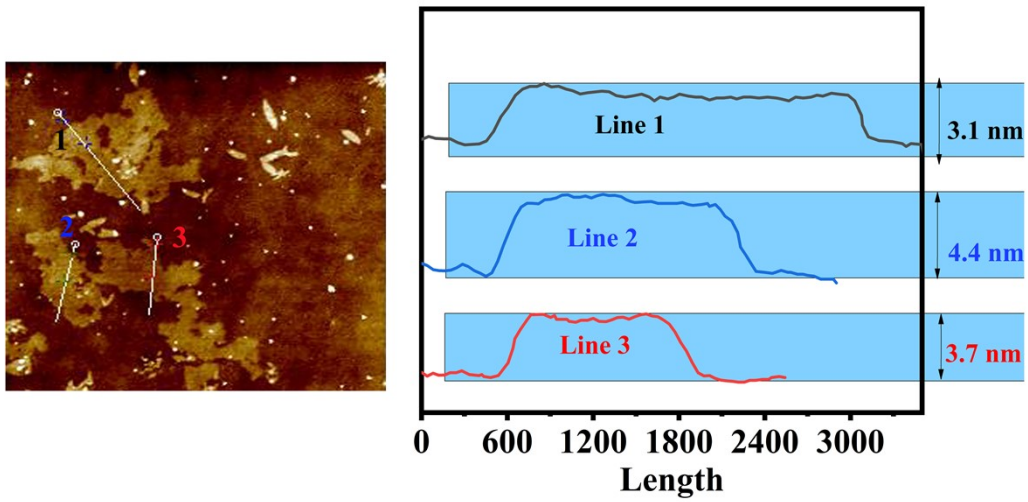

Fig S3 AFM images height profiles of GO

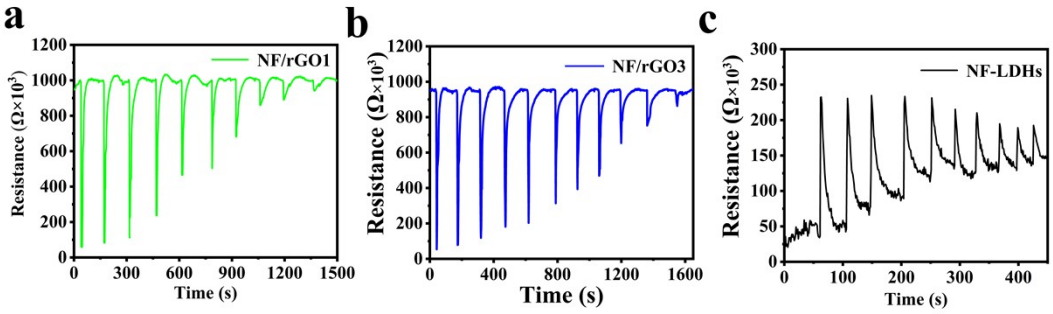

Fig. S4 The dynamical response/recovery transient curves of (a)NF/rGO1,(b)NF/rGO3 and (c) NF-LDHs sensor to 100-0.1 ppm NO_2.

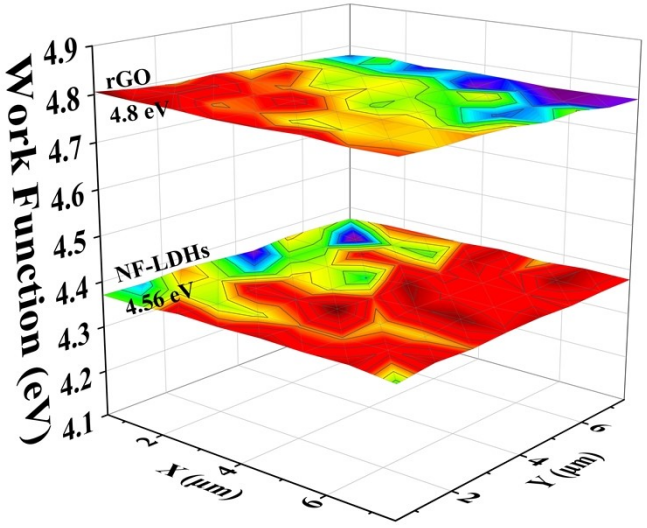

Fig. S5 Work function of NF-LDHs and rGO

Table S1 XRD parameters of NF/rGO series and NF-LDHs

Samples	D_{003}/nm	D_{110}/nm	I_{110}/I_{003}
NF-LDHs	24.55	36.875	0.18
NF/rGO1	6.145	23.779	0.24
NF/rGO2	7.769	13.433	0.35
NF/rGO3	7.946	8.9123	0.21

⋆Based on Scherrer equation $D=0.89\lambda / \beta \cos\theta$，D is Lattice dimension（nm）；β is the full width at half-maximum(in radian)；θ is diffraction angle；λ is the wavelength of X-rays 0.1542 nm

⋆The diffraction intensity ratio of (110) line to (003) line

Table S2　O1s peaks position and peak area ratio of NF-LDHs and NF/rGO

Samples	NF-LDHs			NF/rGO2		
Chemical state	O_a	O_b	O_c	O_a	O_b	O_c
Enegy position (eV)	530.7	531.7	533.6	531.2	532.0	533.3
Peak area ratio (%)	38.06	45.03	16.9	18.96	49.42	31.6

Table S3 The response, response time and recovery time of the three samples expose to NO_2 concentrations at room temperature (RH: 26%)

Sample	NF/rGO1			NF/rGO2			NF/rGO3			NF-LDHs		
NO_2(ppm)	R	Ts	Tr	R	Ts	Tr	R	Ts	Tr	R	Ts	Tr
100	16.5	2.4	56.9	22.3	2.3	46	17.6	4.3	63.3	6.6	2.4	32
50	11.96	3	46	18.6	3.2	34	12.03	11.1	45.2	5.1	2.5	29.3
30	8.63	3.5	32	15.6	4.8	29.6	7.96	14.4	35.4	3.25	2.5	26.2
10	4.2	5.2	26	12.7	6.32	24.5	5.21	17.6	29.2	2.57	2.6	23.6
5	2.13	6.2	21.3	9.24	8.01	21.6	4.67	18.4	25.4	2.05	2.8	20.2
3	1.98	7.3	18.1	7.57	8.6	16.6	3.02	23.6	21.9	1.51	3.1	18.8
1	1.46	9.4	15.6	4.26	9.3	14.3	2.41	24.3	16.5	1.50	3.2	17.5
0.5	1.16	10.2	14.3	3.17	11.3	14.3	1.96	26.1	14.4	1.49	5.4	15.7
0.3	1.12	11.3	12.6	2.45	12.3	12.8	1.45	27.5	12.3	1.42	6.8	12.3
0.1	1.06	12.1	11.3	1.92	13.6	11.6	1.26	29.1	11.2	1.41	7.1	10.2
0.05				1.32	13.8	10.3	1.09	30	10.7			
0.01				1.12	13.9	10.2						

⋆R: Response; Ts: Response time; Tr: Recovery time

Table S4 Parameters obtained by fitting experimental curve to equivalent circuit

Raw materials	N_d	$R_1(\Omega)$	C_1(F)	$R_2(\Omega)$	C_2(F)
NF-LDHs	2.89×10^{15}	1.63×10^{5}	1.52×10^{-12}	4.97×10^{6}	8.96×10^{-11}
NF/rGO1	2.19×10^{16}	7.32×10^{5}	1.14×10^{-10}	1.45×10^{5}	9.81×10^{-12}
NF/rGO2	2.78×10^{16}	7.06×10^{6}	1.20×10^{-10}	1.44×10^{5}	1.10×10^{-11}
NF/rGO3	2.01×10^{16}	5.78×10^{5}	1.33×10^{-10}	1.94×10^{5}	1.00×10^{-11}

⋆N_d = - $(2/e_0\ \varepsilon\ \varepsilon_0)$ $[d(1/C^2)/dV]^{-1}$,$1/C^2$ is the slope of the curve, q is the charge constant ($q=1.69\times10^{11}$), ε_0 is the vacuum dielectric constant (8.859×10^{-14} F cm^{-1}), and ε is the relative dielectric constant of NiFe-LDHs (ε = 20)

Table S5 Current performance of typical gas sensors based on bimetallic composites in literature reports

Samples	Application	Operation temperature	Response/concentration	References
Ag/ NiAl-LDHs	Ethanol gas sensor	RT	10.89/250 ppm	[1]
ZnTi-LDHs/ Ti 3C 2 Tx	NH_3	RT	1.26/100 ppb	[2]
PANI/ZnTi-LDHs	NH_3	RT	9.91/5 ppm	[3]
Zn-Cr-WO-LDHs	Cl_2	RT	60%/100 ppm	[4]
Co-AlLDHs	NO_2	RT	17.09/100 ppm	[5]
CoAl-LDH	NO_2	RT	26.61/100 ppm	[6]
Ni-Al-LDH	O_3	RT	1.84/700 ppb	[7]
ZCiV/ZnCr-LDHs	SO_2	RT	71.71%/100 ppm	[8]
PS@Co-LDH	Ethanol vapour	200°C	2.48/4.3 ppm	[9]
Zn-TiLDHs/rGO	NO_2	RT	97%/100 ppm	[10]
NiFe LDH/rGO	NO_2	RT	22.3/100 ppm	This work

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