Supplementary Data

Cr Doping WO_3 Nanofibers Enriched with Surface Oxygen Vacancies for Highly Sensitive Detection of 3-Hydroxy-2-Butanone Biomarker

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Outline

2% Cr/WO_3 NFs.

Fig. S4. N_2 adsorption/desorption isotherms of the pristine and 2% Cr/WO_3 NFs.

Fig. S5 (a) Full XPS spectrum of 2% Cr/WO_3 NFs; (b) High-resolution Cr 2p spectrum of 2% Cr/WO_3 NFs, where two peaks at higher and lower binding energies are assigned to Cr $2p_{1/2}$ and Cr $2p_{2/3}$, respectively.

Fig. S6. Gas sensitivities of the 2% Cr/WO_3 NFs sensor as a function of the operating temperature to 5 ppm 3H-2B (a) and 100 ppm acetone (b), which show the optimal working temperature at 140 ^{o}C and 260 ^{o}C, respectively.

Table S1 Comparison of the gas-sensing performance of various modified WO_3 sensors to VOCs.

Table S2 Selectivity investigation of the 2% Cr/WO_3 NFs sensor in a gas mixture at 140 ^{o}C.

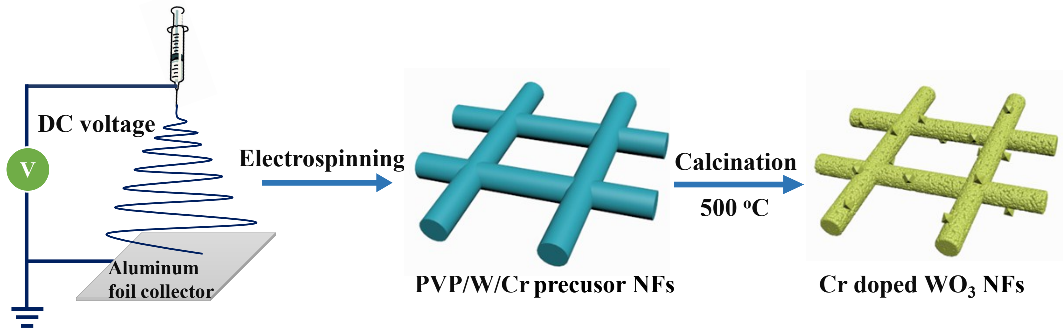


Fig. S1 Schematic diagram of synthetic procedure of the Cr/WO_3 NFs. PVP/W/Cr precursor NFs were prepared via electrospinning followed by calcination at 500 ^oC to obtain Cr/WO_3 NFs.

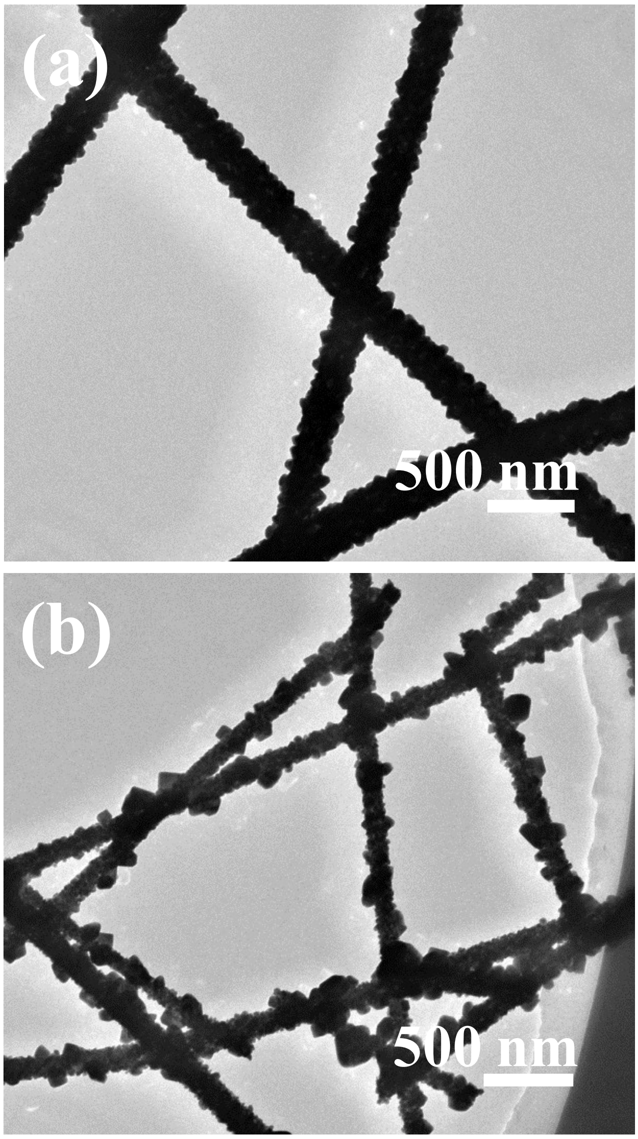


Fig. S2 TEM images of pristine and 2% Cr/WO_3 multiple NFs. Pristine WO_3 NFs show uniform surface morphology while 2% Cr/WO_3 NFs contain fiber stems and attached particles on the fiber.

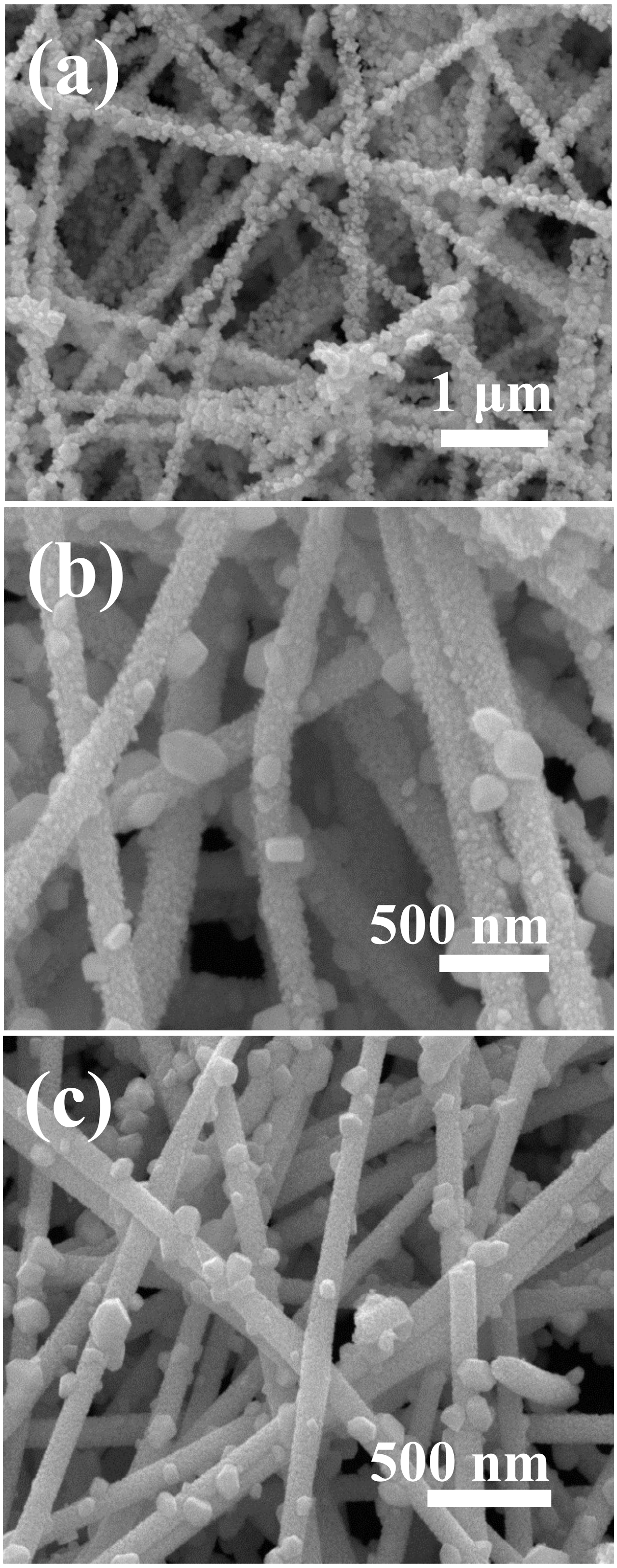
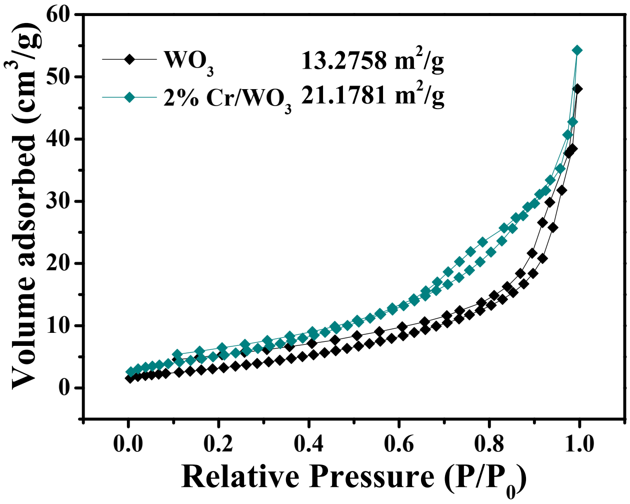


Fig. S3 SEM images of 0.5% (a), 1% (b) and 3% wt (c) Cr/WO_3 NFs. 0.5% Cr/WO_3 NFs have similar morphology feature relative to pristine WO_3 NFs, while those with 1% and 3% Cr dopants contain a fiber stem and attached particles similar to 2% Cr/WO_3 NFs.



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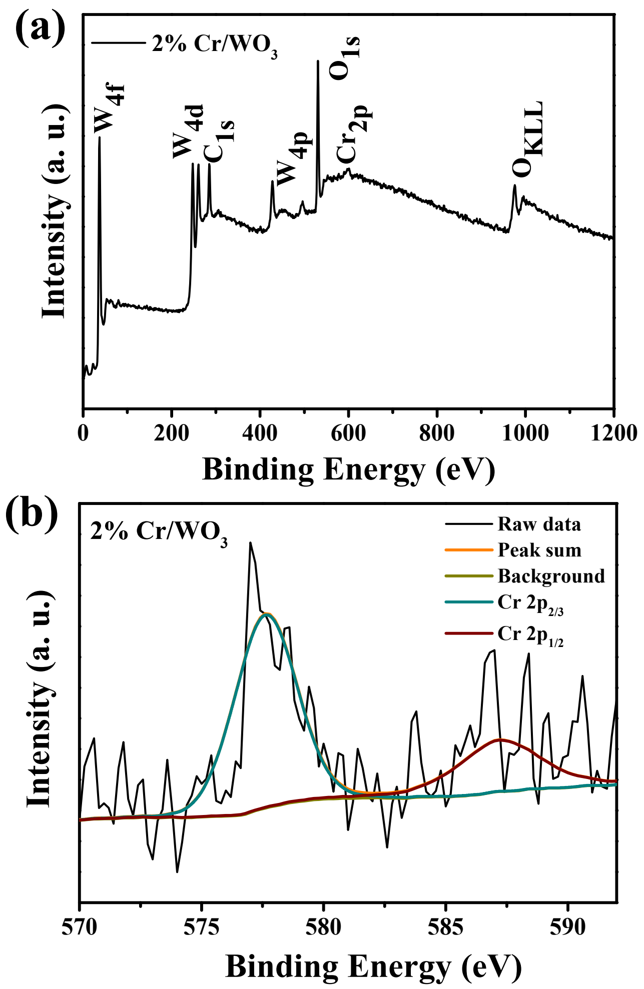

Fig. S5 (a) Full XPS spectrum of 2% Cr/WO_3 NFs. (b) High-resolution Cr 2p spectrum of 2% Cr/WO_3 NFs, where two peaks at higher and lower binding energies are assigned to Cr $2p_{1/2}$ and Cr $2p_{2/3}$, respectively.

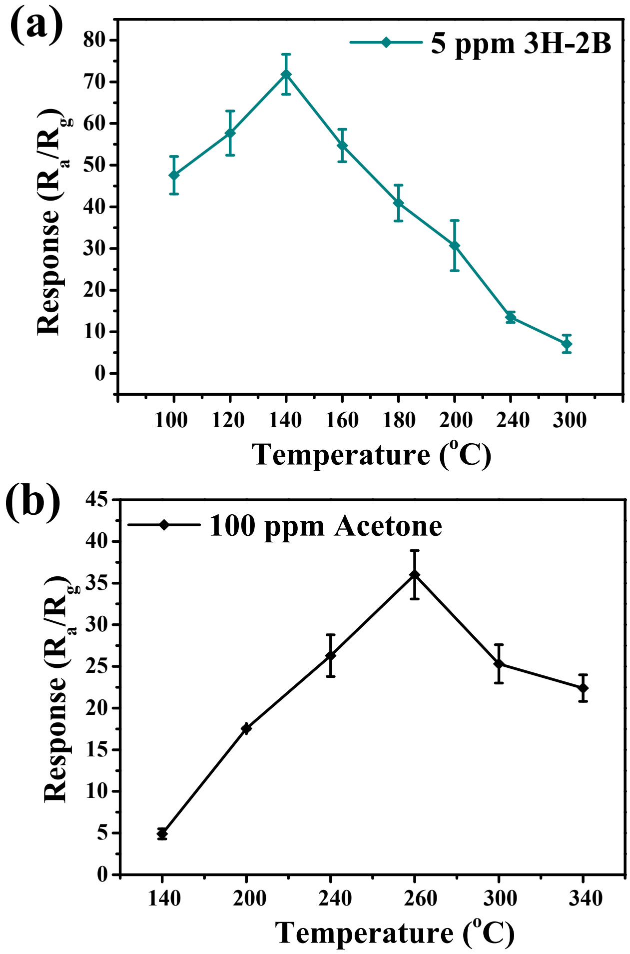

Fig. S6. Gas sensitivities of the 2% Cr/WO_3 NFs sensor as a function of the operating temperature to 5 ppm 3H-2B (a) and 100 ppm acetone (b), which show the optimal working temperature at 140 °C and 260 °C, respectively.

Table S1 Comparison of the gas-sensing performance of various modified WO_3 sensors to VOCs

Samples	**Gases**	**C (ppm)**	**Temp. (°C)**	**S(R_a/R_g)**	**Detection limit (ppm)**	**Refs.**
Cu-doped WO_3 hollow fibers	Acetone	20	300	6.43	0.25	[1]
C-doped WO_3 hollow sphere	Acetone	10	300	~11	0.2	[2]
Co-doped WO_3 flower-like nanostructures	Acetone	50	350	69	1	[3]
Cu-doped WO_3	Trimethylamine	10	290	49.6	0.5	[4]
Rh_2O_3-functionalized WO_3 nanofibers	Acetone	5	350	41.5	0.1	[5]
Pt-Functionalized WO_3 hemitube	Acetone	2	300	4.11	0.12	[6]
Pd functionalized WO_3 nanofibers	Toluene	1	350	5.5	0.12	[7]
Au functionalized WO_3	*n*-butanol	10	250	63.6	/	[8]
Pd-loaded WO_3 nanofiber	Acetone	5	400	28.9	0.1	[9]
Cr/WO_3 NFs	3H-2B	5	140	67	0.05	This work

References

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Table S2 Selectivity investigation of the 2% Cr/WO_3 NFs sensor in a gas mixture at 140 ^{o}C.

Gases	Average Sensitivity (R_a/R_g)
10 ppm 3H-2B	135.2
10 ppm + Interfering gas mixture	138.7
5 ppm 3H-2B	71.5
5 ppm + Interfering gas mixture	67.2
0.5 ppm 3H-2B	18.9
0.5 ppm 3H-2B + Interfering gas mixture	20.1

Interfering gas mixture: 100 ppm ethanol + 100 ppm acetone + 100 ppm toluene + 100 ppm benzaldehyde