Supplementary Materials: Mesoporous WN/WO_3-Composite Nanosheets for the Chemiresistive Detection of NO_2 at Room Temperature

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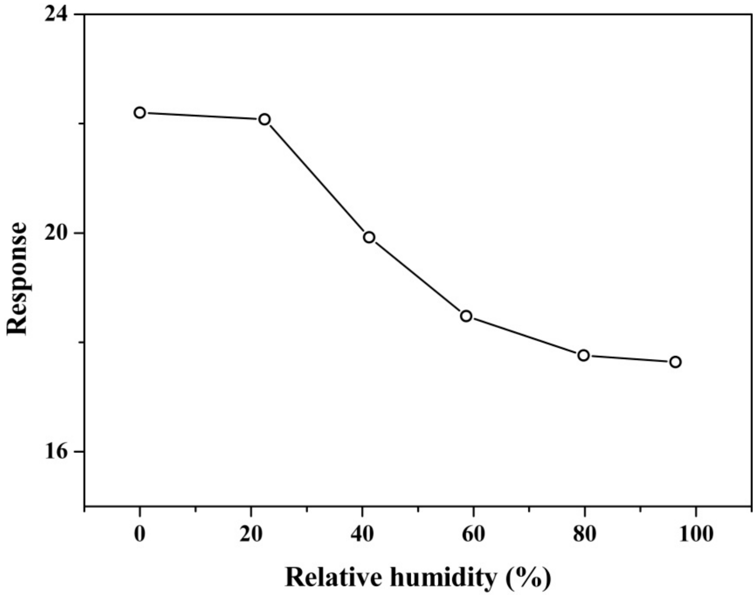

Figure S1. Sensor response of WN/WO_3 composites sensor at RT upon exposure to 200 ppb NO_2 concentration at various relative humidity (RH).

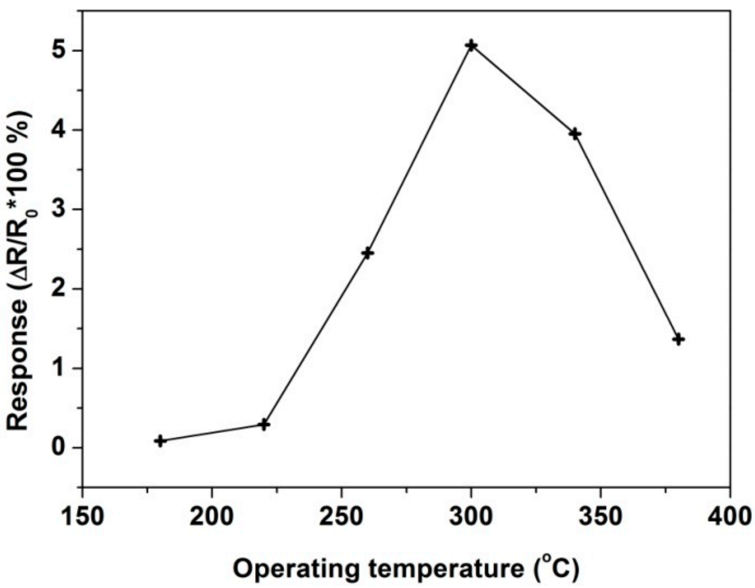

Figure S2. Response of the sensor based on WO_3 nanosheets to 100 ppb NO_2 as a function of the operating temperature.

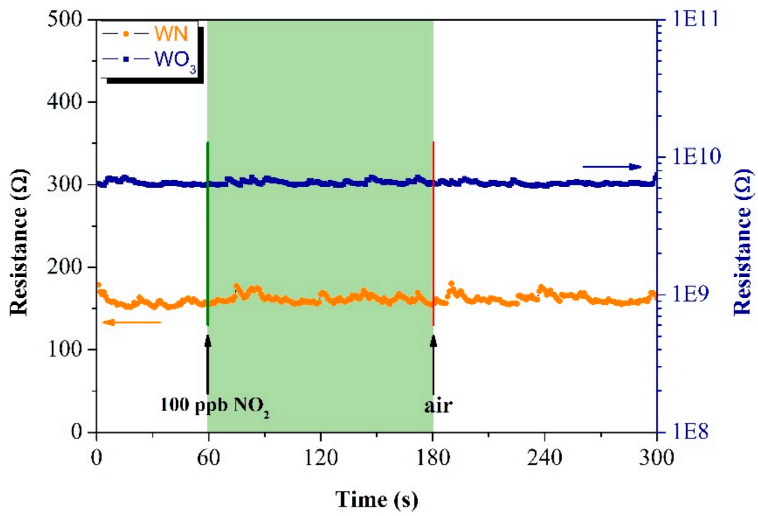

Figure S3. Resistances of the sensors based on WN and WO_3 to 100 ppb NO_2 at room temperature. (The green area represents the sensors in NO_2 gas.)

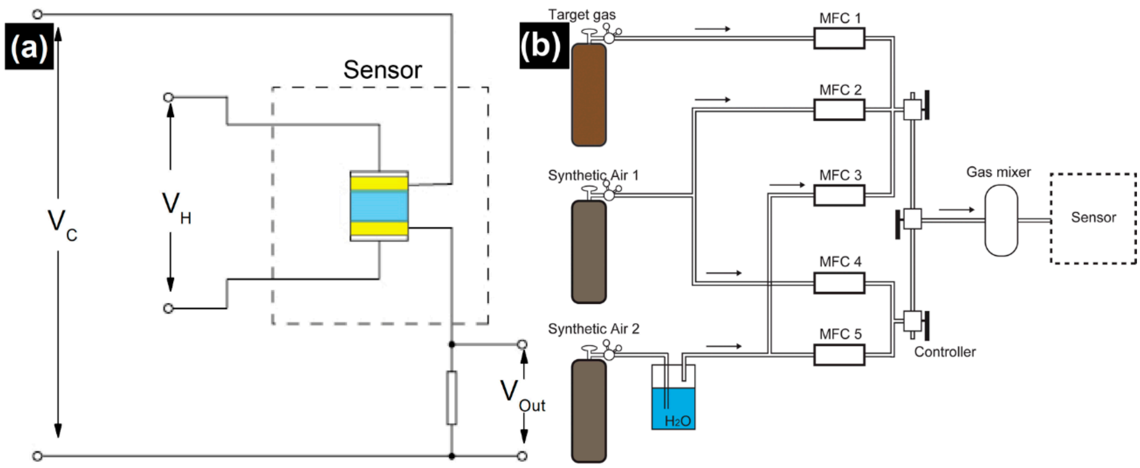

Figure S4. The schematic illustration of (**a**) gas sensing analysis system and (**b**) gas mixing line equipment. (The blue color means the sensing films and the yellow color means the electrodes of the sensor.)

Calculation of Theoretical Limit of Detection Using Signal/Noise Ratio

The sensor noise was calculated using the variation in the relative sensor response in the baseline using the root-mean-square deviation (RMSD) [7]. 60 points obtained from Figure 3a before exposure to NO_2 were averaged and a standard deviation ($V_{\chi 2}$) was gathered as 0.121 (1.21×10^{-1}).

$$RMS_{noise} = \sqrt{\frac{V_{\chi^2}}{N}} = \sqrt{\frac{0.121}{60}} = 0.0449 \quad (1)$$

where N is the number of data points. The RMS_{noise} was calculated to be 4.49×10^{-2}. According to the International Union of Pure and Applied Chemistry (IUPAC) definition, the signal (S) to noise (N) ratio (S/N) is 3, and the slope is 0.55 from Figure 3b, so that:

$$LOD = 3\frac{RMS_{noise}}{Slope} = 3 \times 0.0449 \div 0.105 = 1.28\,\text{ppb} \quad (2)$$

Thus, the theoretical NO_2 limit of detection was calculated to be approximately 1.28 ppb in our work.