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# Supplementary Information

# Indoor Light-Activated Cone-Shaped $MoS_2$ Gas Sensor for Room-temperature ppb-level Detection on NO Gas

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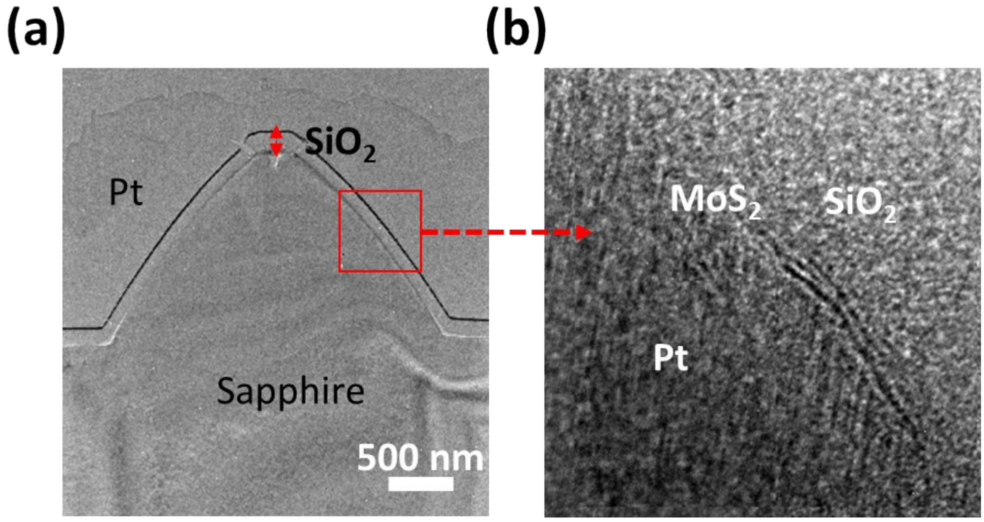


**Figure S1** (a) TEM images of $MoS_2$ grown on cone-shaped sapphire substrate. (b) Enlarged view of (a), confirming the discontinuity of monolayer $MoS_2$.

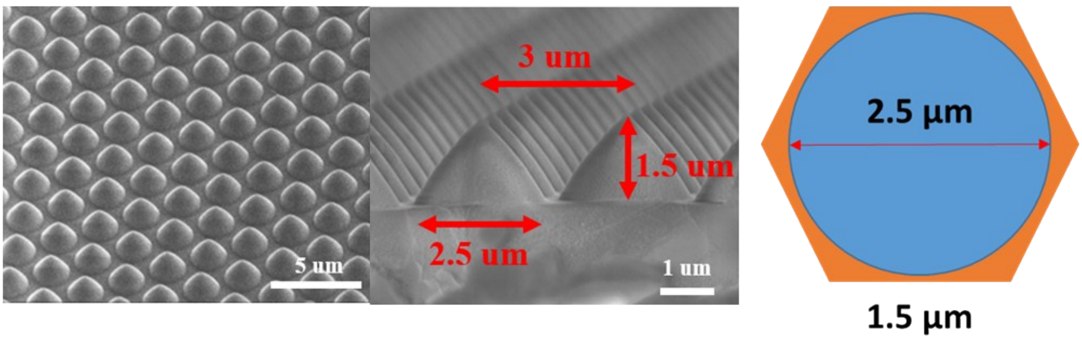


**Figure S2** SEM images of cones periodically arranged on sapphire with their corresponding size. Flat area of 5.85 $\mu m^2$ can be given by 6x 1.5 x 1.3 x 0.5 while surface area of 7.64 $\mu m^2$ per cone can be given by 1.95 x 1.95 x $\pi$ x 0.64, yielding the ratio between flat area and surface area per cone being 1.3 by ($\frac{7.64}{5.85}$).

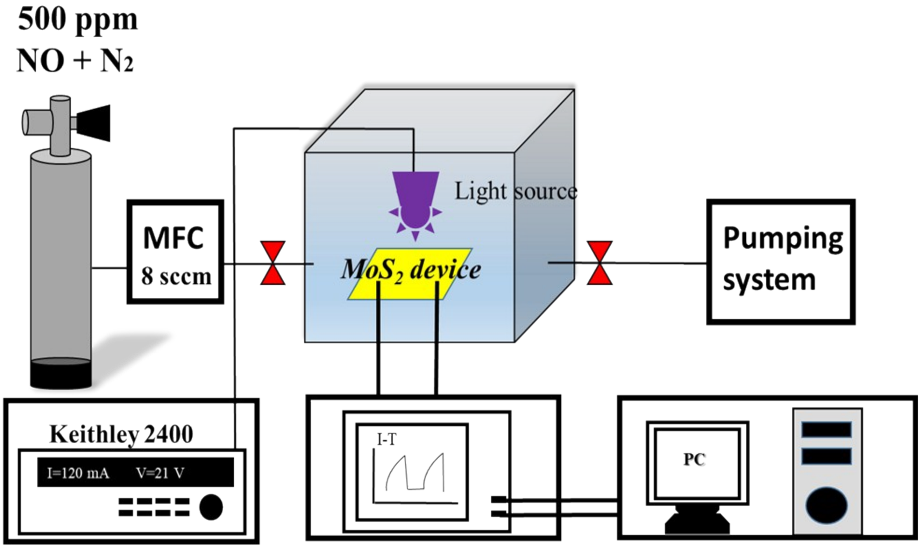


**Figure S3** Schematic of the hand-made gas sensor measurements including a chamber and a stage where the light source was installed and linked to a Keithley system. Mass flow controller (MFC) controls the concentrations of NO and $N_2$ gases.

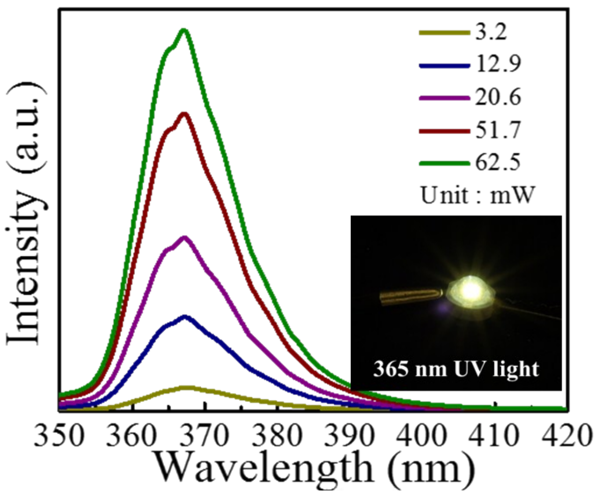


**Figure S4** The radiant flux of UV light with the wavelength of 365 nm as the functions of emitting powers.

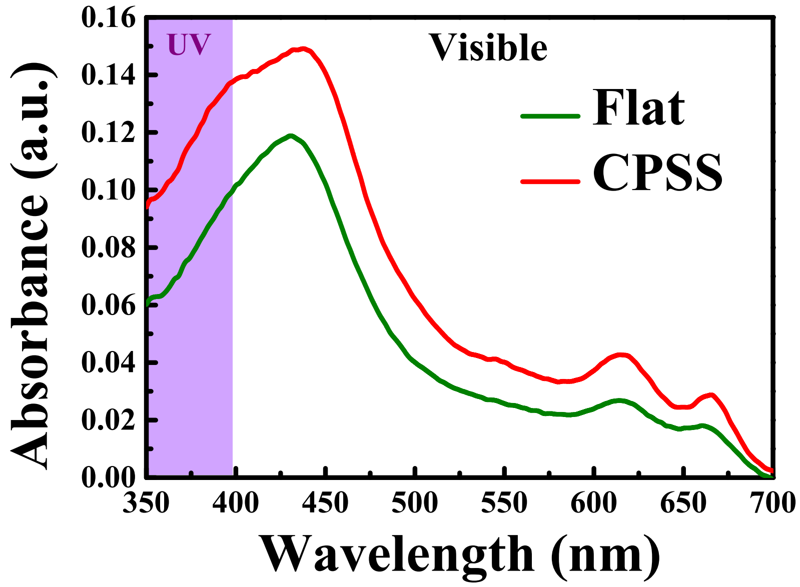


**Figure S5** UV-Vis absorption spectra of F-$MoS_2$ (green) and CS-$MoS_2$ (red).

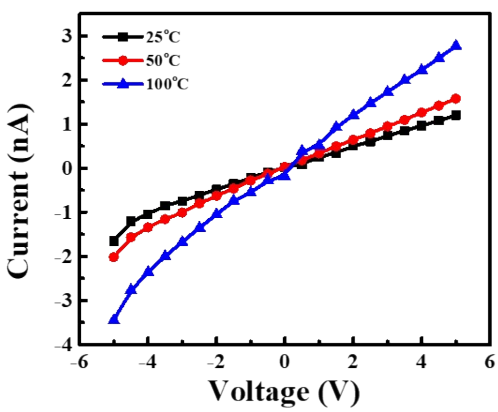


**Figure S6** I-V characteristics of F-$MoS_2$ GS measured at 25 (black), 50 (red) and 100 $^{o}C$ (blue), respectively. The conductance of $MoS_2$ bilayers increases as temperature increases, confirming a semiconductor property of $MoS_2$ bilayers.

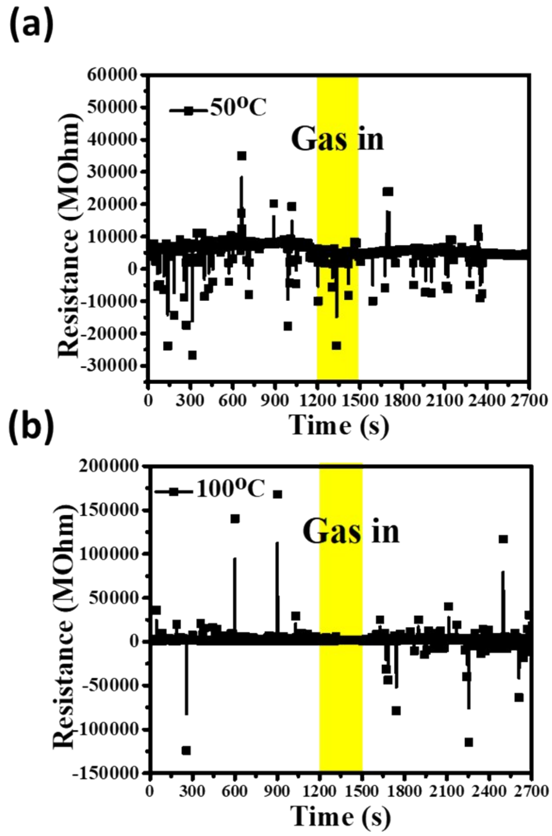


**Figure S7** 1ppm NO gas sensing measurements of F-$MoS_2$ GS at operating temperatures of (a) 50 °C, (b) 100 °C. The sluggish response was proved that our devices would not be promoted by heating.

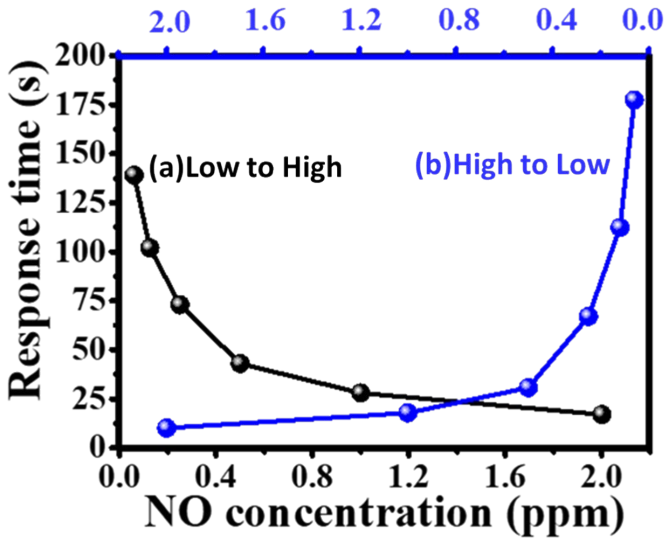


**Figure S8** A plot of response time as a dependence of NO concentration gradient from (a) low to high and (b) high to low.

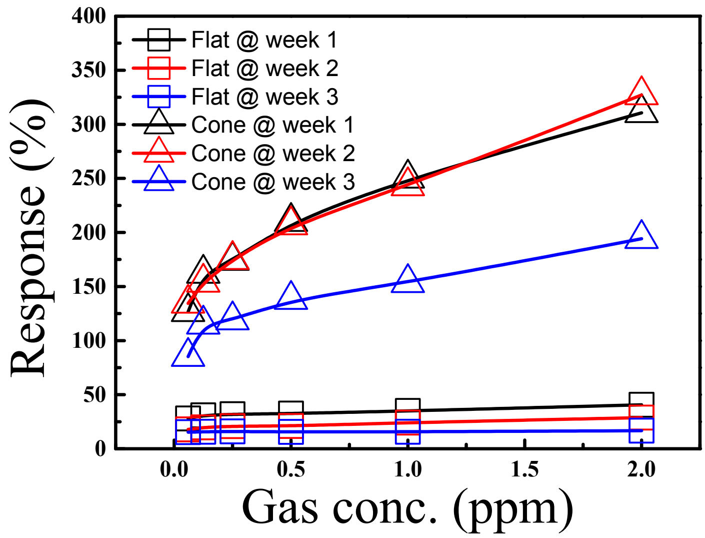


**Figure S9** A plot of response over 3 weeks as a dependence of NO concentration gradient for both F-$MoS_2$ GS and CS-$MoS_2$ GS.

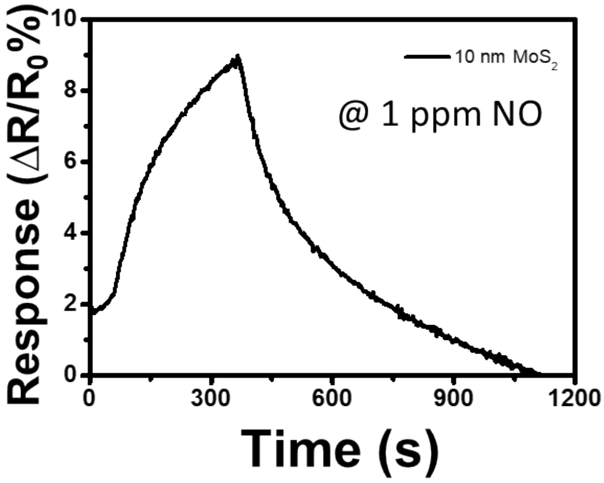


**Figure S10** 1ppm NO gas sensing measurements of C-$MoS_2$ GS with layered thickness of 10 nm at operating temperatures

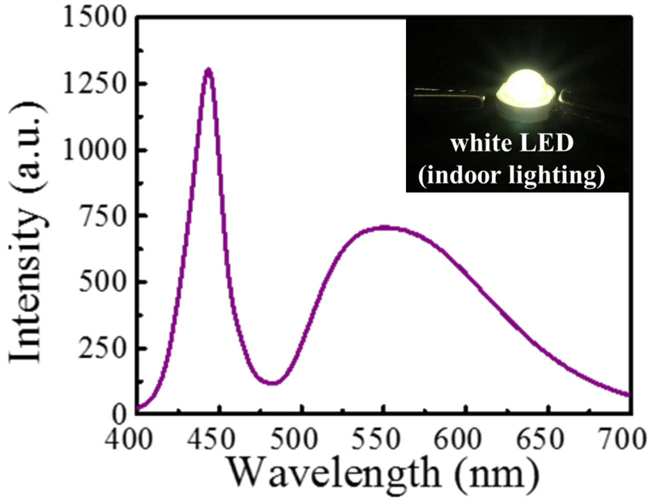


**Figure S11** The radiant flux of the white-light LED. Inset shows an image of a white-light LED for the indoor lighting.