Supporting Information for Ultra-Fast and Ultra-Sensitive Gas Sensors Derived from Large Fermi-Level Shift in Schottky Junction with Sieve-layer Modulation

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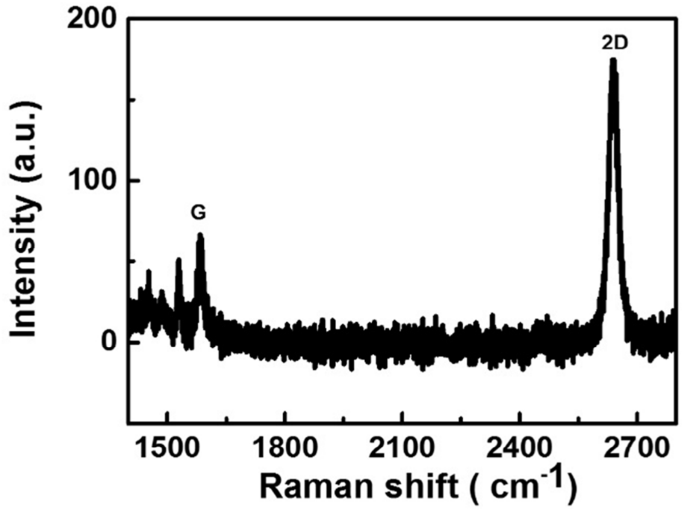

Figure S1. Raman spectrum of graphene. The single layer graphene is confirmed by the intensity ratio of G to 2D band. The absence of D band intensity at around 1350 cm^{-1} confirms the high quality of the transferred graphene.

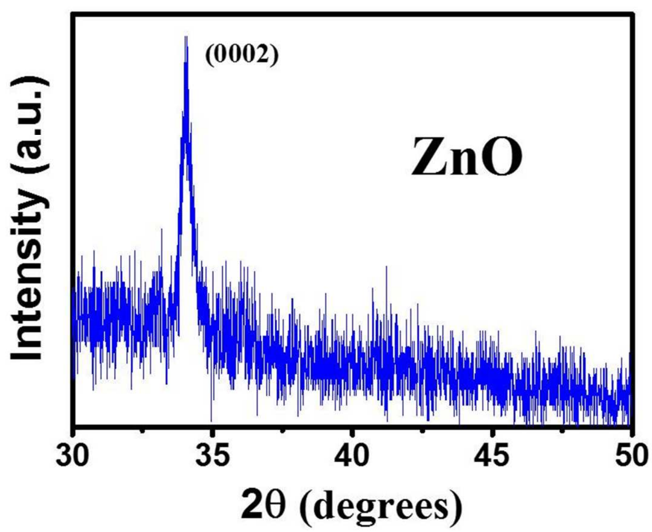

Figure S2. X-ray diffraction (XRD) spectrum of ZnO film on silicon, which shows hexagonal-wurtzite structure with a c-axis preferred orientation.

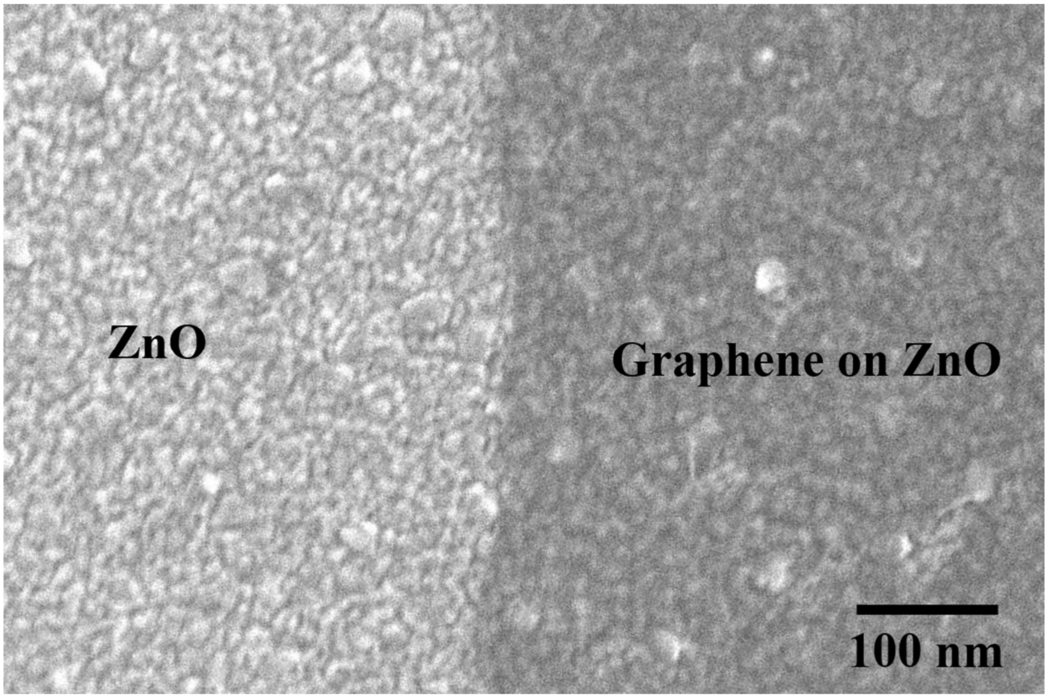

Figure S3. SEM image of graphene on ZnO/Si. It shows that the graphene layer can be transferred well on top of ZnO film surface.

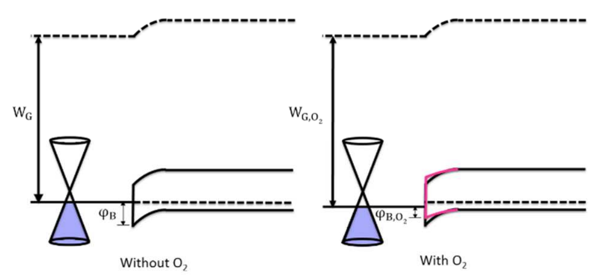

Figure S4. The working mechanism of the sensor without sieve layer. Because there is no sieve layer to block the transfer of holes from graphene into Si layer, the changes of the Fermi level and the Schottky barrier are therefore greatly reduced due to the large density of states of bulk Si.

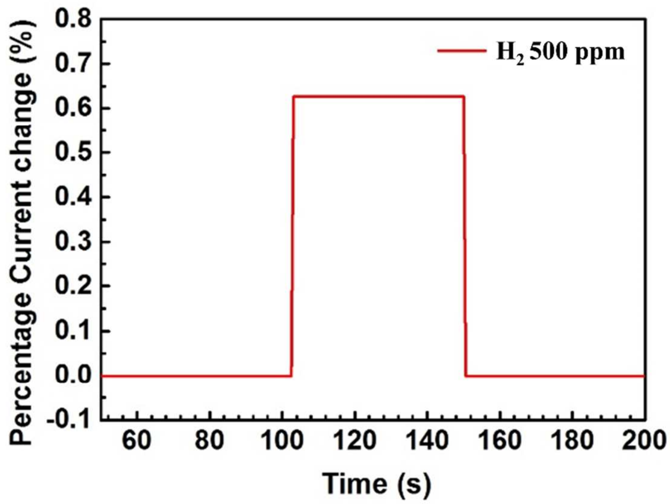

Figure S5. Real time percentage change of current response to 500 ppm of H_2 exposure for the device under an applied forward bias of 4.7 V. This proof-of-concept demonstration shows that our device can detect hydrogen gas with high sensitivity and fast response as good as that for the detection of oxygen gas.