

Supporting Information

Graphene oxide templating: facile Synthesis of morphology engineered crumpled SnO₂ nanofibers for superior chemiresistor

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Table S1. A spectral feature table of O⁻ and O²⁻ in dense SnO₂ NFs, 2D SnO₂ NSs, C_2D SnO₂ NFs, and Pt-C_2D SnO₂ NFs.

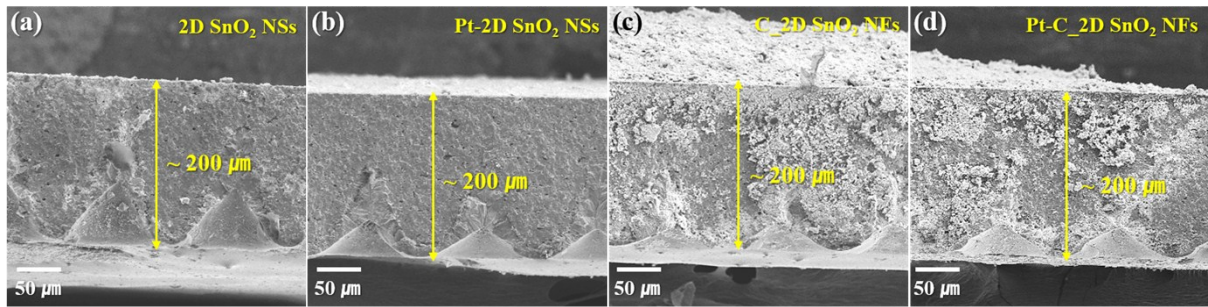


Figure S1. Cross-sectional SEM images of (a) 2D SnO₂ NSs, (b) Pt-2D SnO₂ NSs, (c) C_2D SnO₂ NFs, and (d) Pt-C_2D SnO₂ NFs.

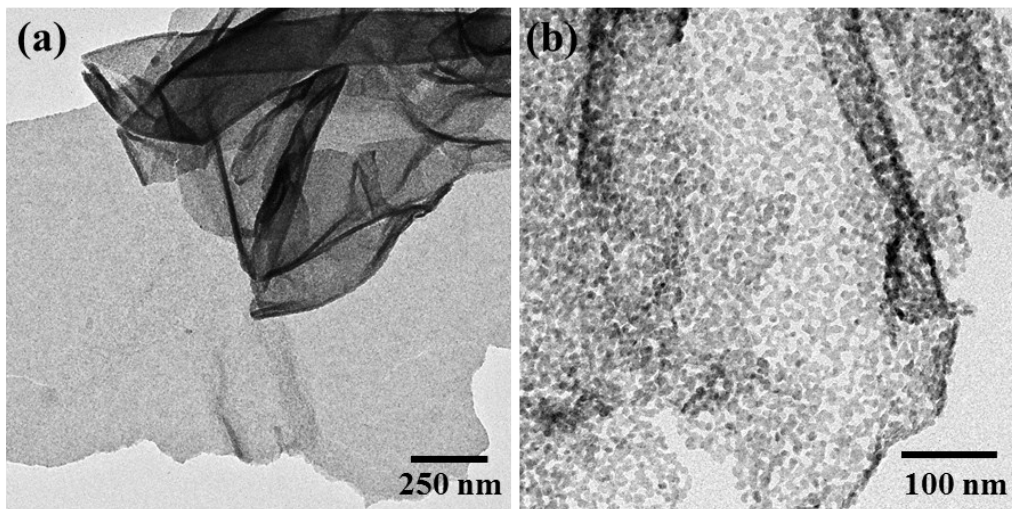


Figure S2. (a) TEM image of Sn-coated GO sheet, and (b) 2D SnO₂ NSs after calcination in air at 500 °C for 1 h.

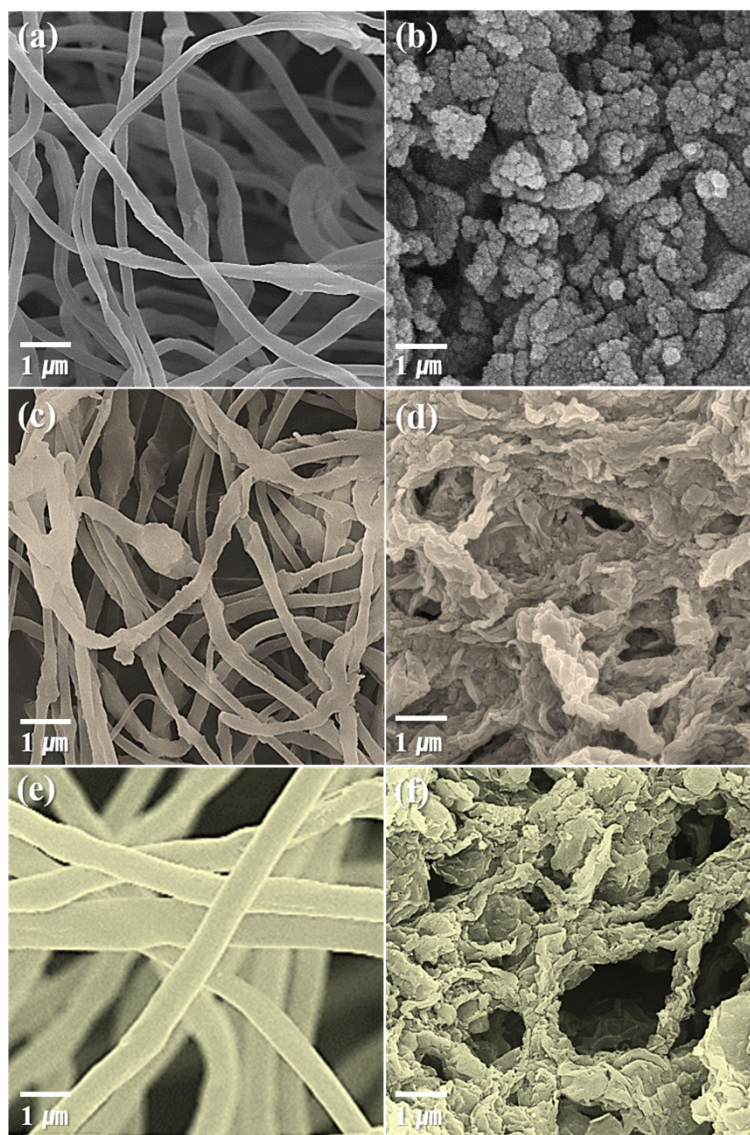


Figure S3. SEM images of (a) as-spun 0.05 g Sn-GO/PVP NFs, (b) calcined sample of (a) at 500 °C for 1 h, (c) as-spun 0.10 g Sn-GO/PVP NFs, and (d) calcined sample of (c) at 500 °C for 1 h, (e) as-spun 0.14 g Sn-GO/PVP NFs, and (f) calcined sample of (e) at 500 °C for 1 h.

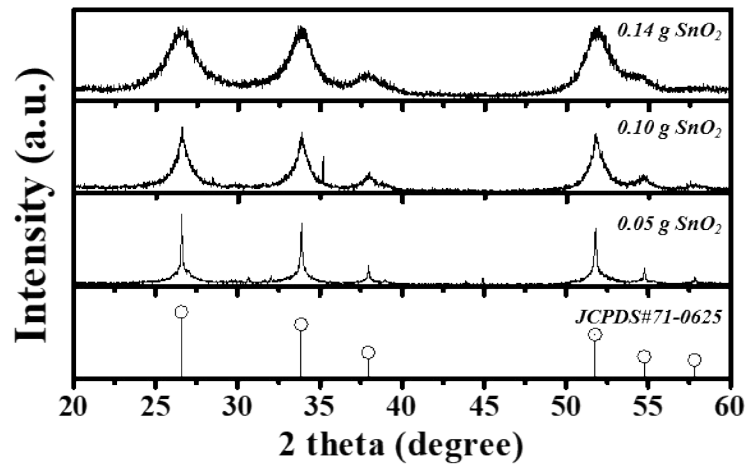


Figure S4. PXRD analysis of C₂D SnO₂ NFs synthesized from solutions containing three different amounts of Sn-GO sheets, i.e., 0.05, 0.10, and 0.14 g.

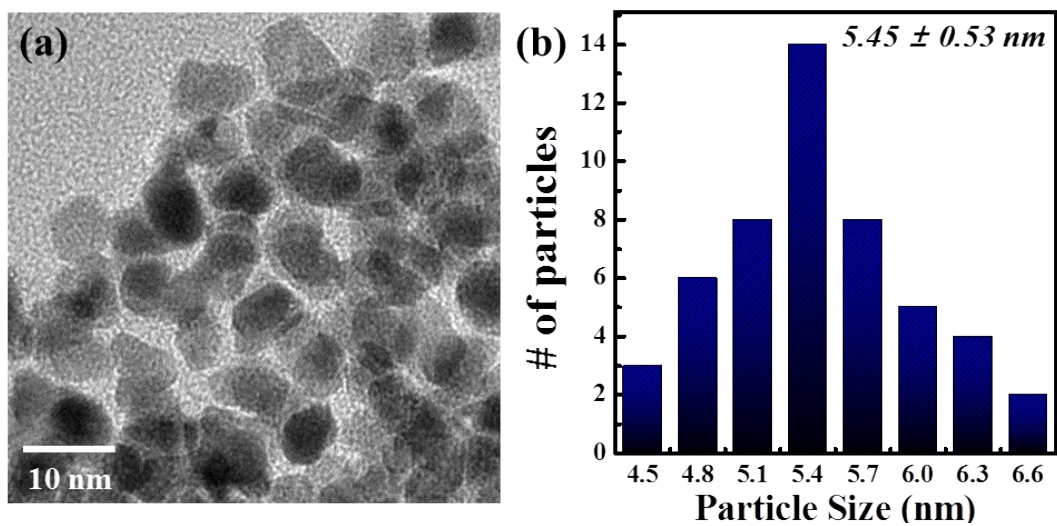


Figure S5. (a) TEM image of polyol-Pt NPs, and (b) histogram for particle size distribution.

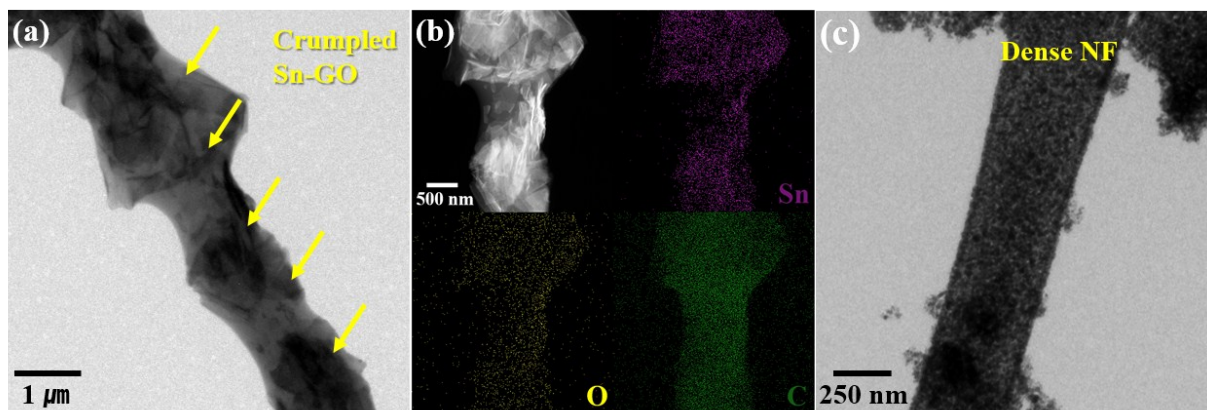


Figure S6. (a) TEM image of as-spun Sn-GO/PVP NF, (b) STEM image and EDS mapping of Sn-GO/PVP NF with respect to Sn, O, and C, and (c) TEM image of dense SnO₂ NF.

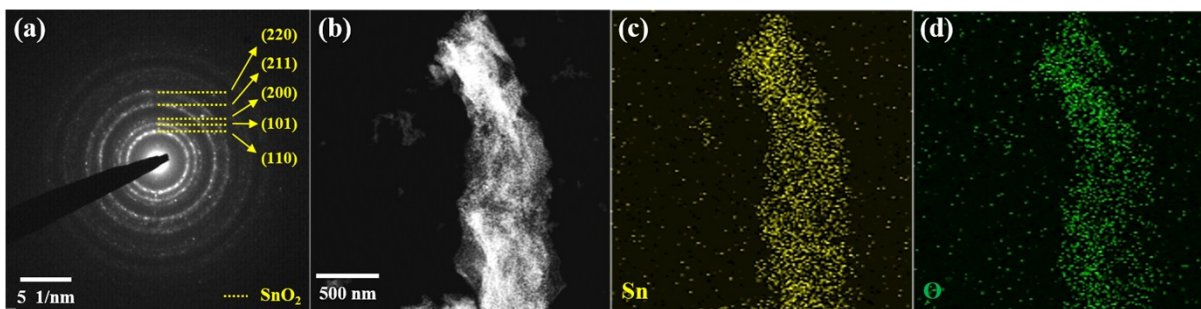


Figure S7. (a) SAED pattern of C₂D SnO₂ NFs, (b) a dark field STEM image of the C₂D SnO₂ NF, and EDS mapping of the C₂D SnO₂ NF with respect to (c) Sn and (d) O elements.

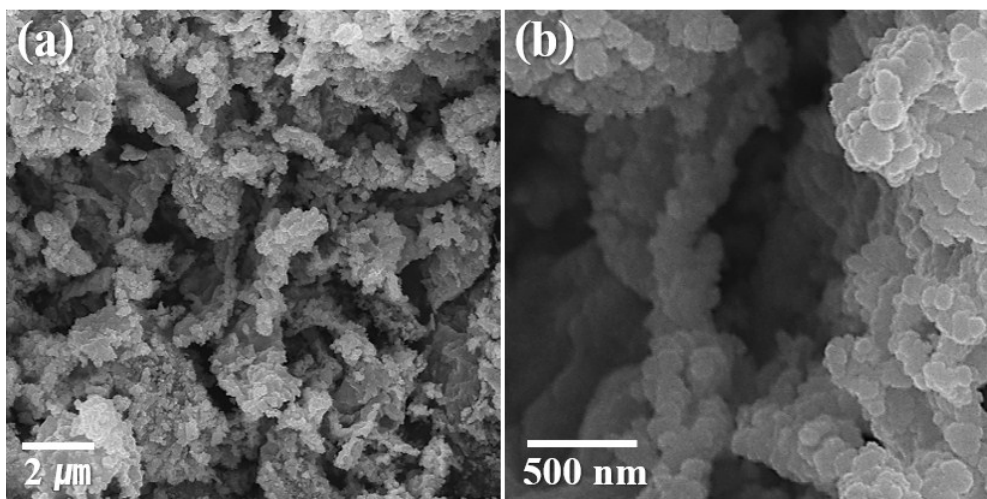


Figure S8. SEM images of (a) postcalcined C₂D SnO₂ NFs at 600 °C for 1 h and (b) high resolution SEM image of (a) collapsed NFs structure with large grain size.

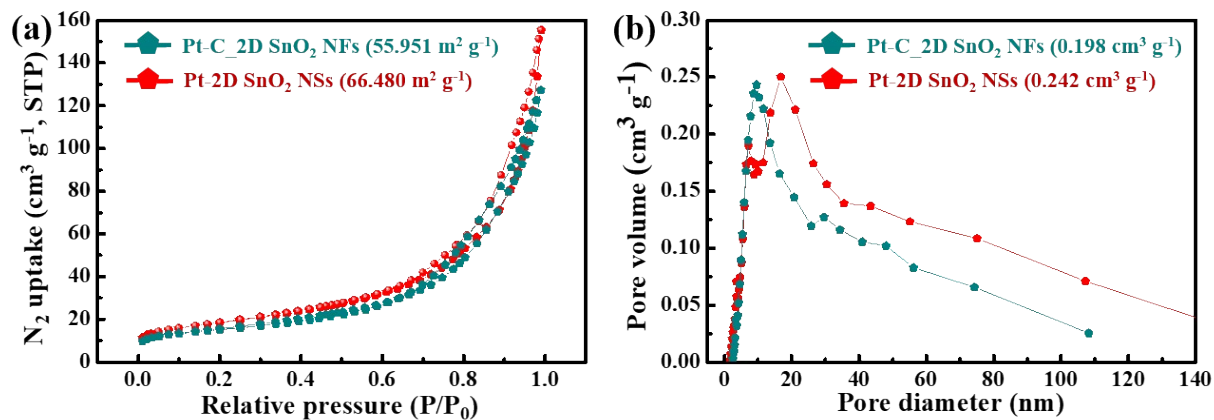


Figure S9. (a) Isothermal adsorption/desorption plot and BET surface area of Pt-C₂D SnO₂ NFs and Pt-2D SnO₂ NSs, and (b) pore size distribution of Pt-C₂D SnO₂ NFs and Pt-2D SnO₂ NSs.

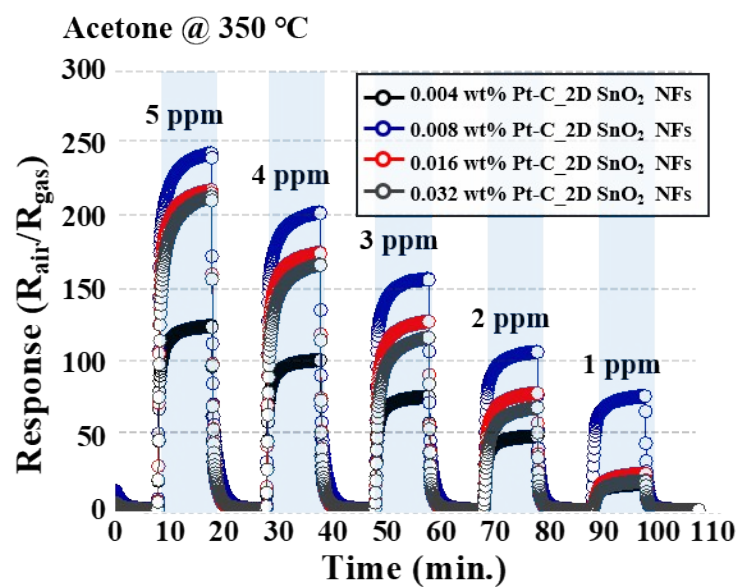


Figure S10. Dynamic response characteristics of catalyst loaded NFs toward 1–5 ppm of acetone at 350 °C.

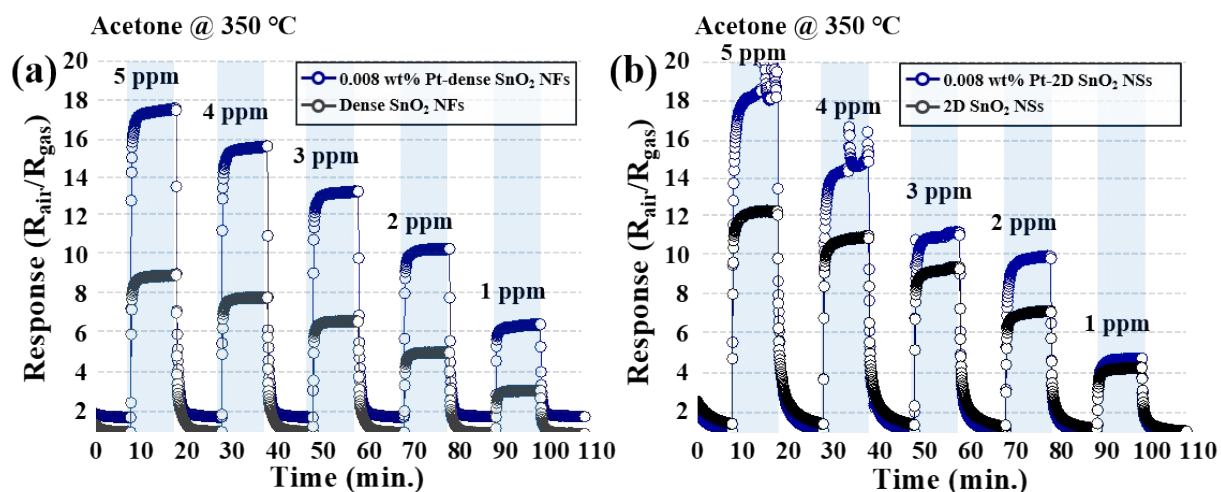


Figure S11. Dynamic response characteristics of (a) 0.008 wt% Pt loaded dense SnO₂ NFs and pristine dense SnO₂ NFs toward 1–5 ppm of acetone at 350 °C, and (b) 0.008 wt% Pt loaded 2D SnO₂ NSs and pristine 2D SnO₂ NSs toward 1–5 ppm of acetone at 350 °C.

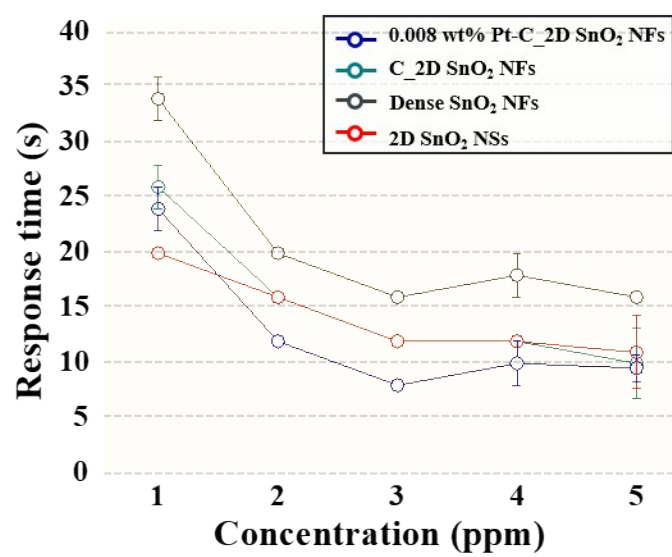


Figure S12. Response times of four different sensing layers to 1–5 ppm of acetone at 350 °C.

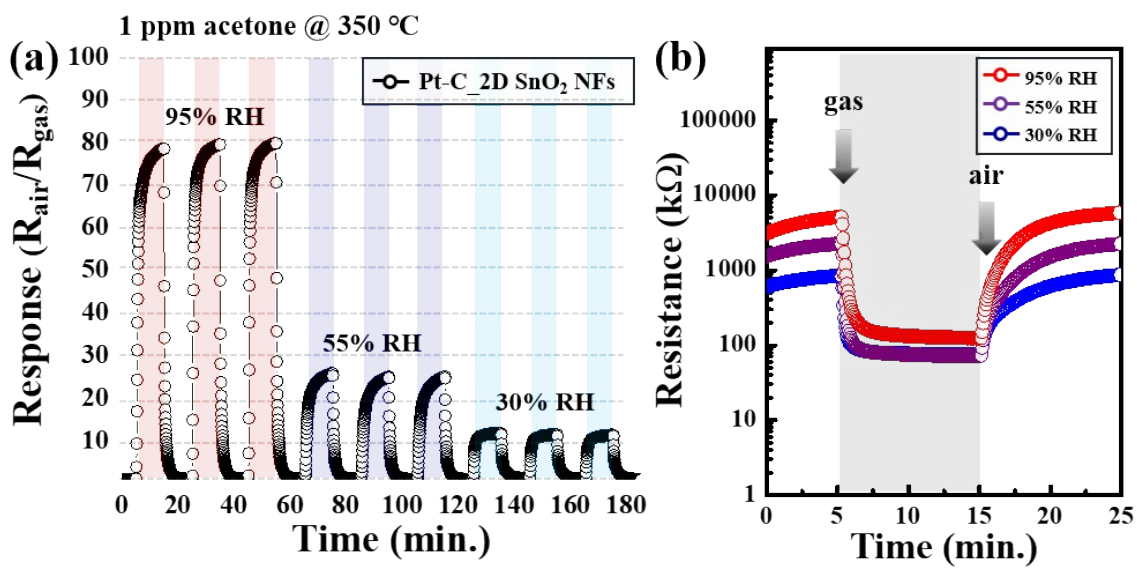


Figure S13. (a) Dynamic response characteristics of 0.008 wt% Pt-C₂D SnO₂ NFs toward acetone and (b) dynamic variation in resistance toward 1 ppm of acetone at 350 °C under three different humidity levels, i.e., 30%, 55%, and 95% RH.

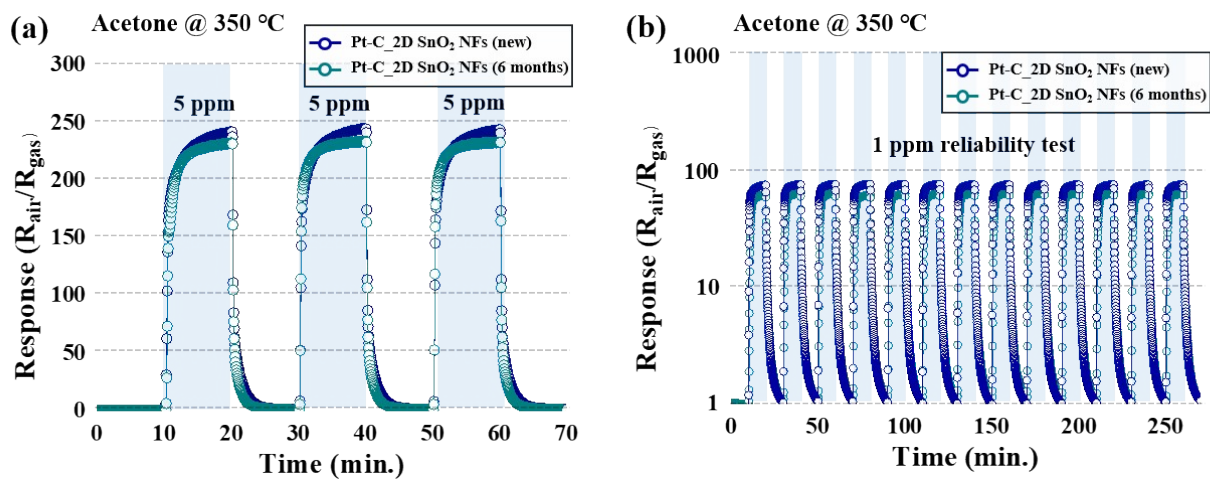


Figure S14. (a) Long-term stability tests of Pt-C₂D SnO₂ NFs toward 5 ppm acetone at 350 °C using the new and 6-month old sensors and (b) reliability tests of Pt-C₂D SnO₂ NFs toward 1 ppm acetone for 13 cycles at 350 °C using the new and 6-month old sensors.

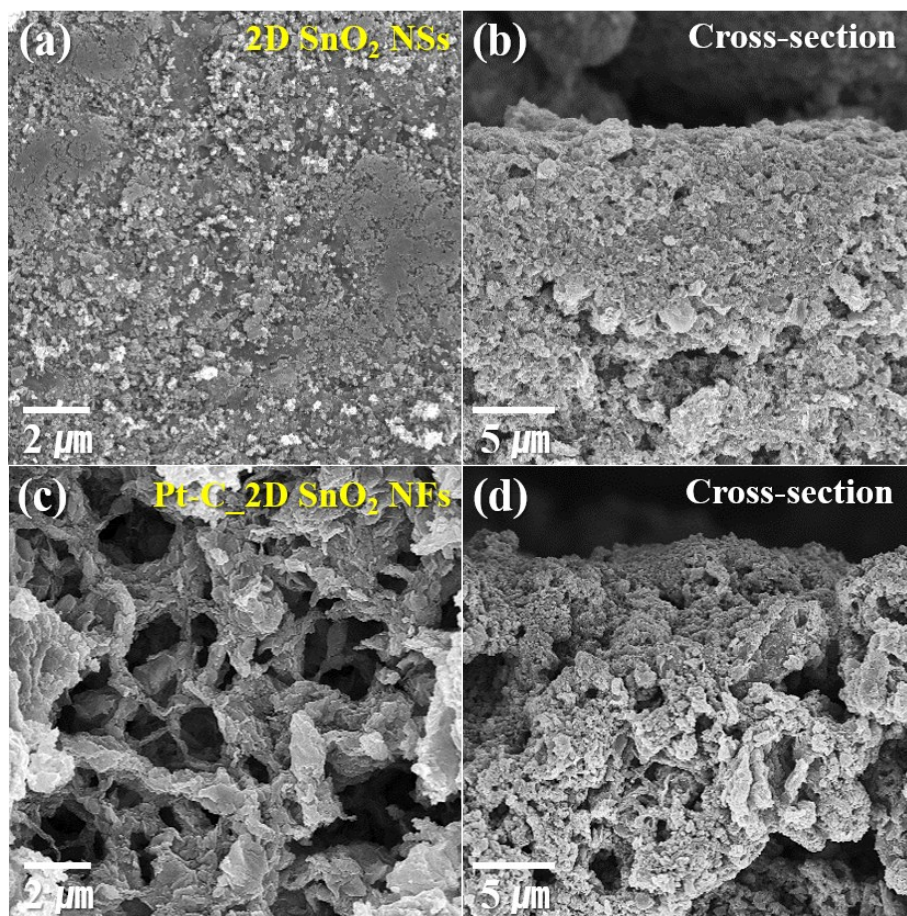


Figure S15. (a) Low-resolution SEM image of the 2D SnO₂ NSs sensing layer and (b) cross-sectional SEM image of (a) upon coating on an alumina substrate. (c) Low-resolution SEM image of the 0.008 wt% Pt-C_2D SnO₂ NFs sensing layer and (d) cross-sectional SEM image of (c) upon drop coating on an alumina substrate.

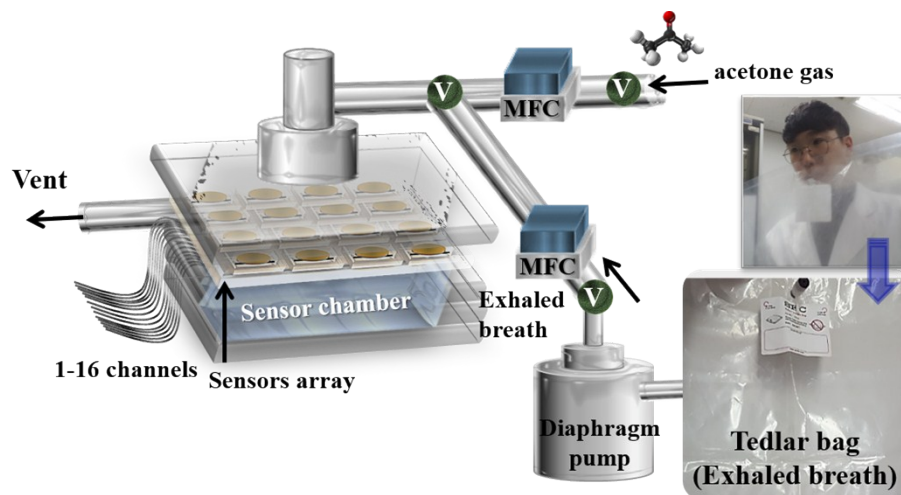


Figure S16. Schematic illustration of the sensor measurement system for detection of healthy and simulated diabetic breath. The exhaled breaths were collected in Tedlar bags and flown into the sensors array by a diaphragm pump.

Table S1. A spectral feature table of O⁻ and O²⁻ in dense SnO₂ NFs, 2D SnO₂ NSs, C_2D SnO₂ NFs, and Pt-C_2D SnO₂ NFs.

Spectral Feature Table			
Element/sample	Peak Energy (eV)	Peak Area (eV counts)	Ratio (O ⁻ /O ²⁻)
O ²⁻ (1s)/Dense SnO ₂ NFs	530.35	65281.02	0.837
O ⁻ (1s)/Dense SnO ₂ NFs	531.08	54649.87	
O ²⁻ (1s)/2D SnO ₂ NSs	530.64	87242.65	1.173
O ⁻ (1s)/2D SnO ₂ NSs	531.38	102377.92	
O ²⁻ (1s)/C_2D SnO ₂ NFs	530.53	62640.81	1.033
O ⁻ (1s)/C_2D SnO ₂ NFs	531.30	64722.88	
O ²⁻ (1s)/Pt-C_2D SnO ₂ NFs	530.58	73881.78	1.176
O ⁻ (1s)/Pt-C_2D SnO ₂ NFs	531.29	86848.09	