

Supporting Information

Design of hierarchical SnSe₂ for efficient trace detection of NO₂ at room-temperature

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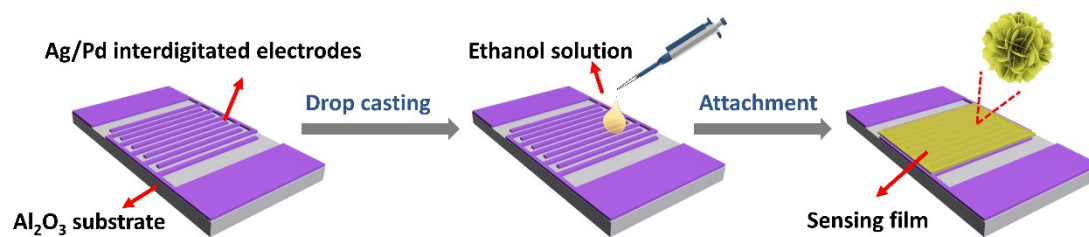


Fig. S1 Fabricated technological process diagram of gas sensor.

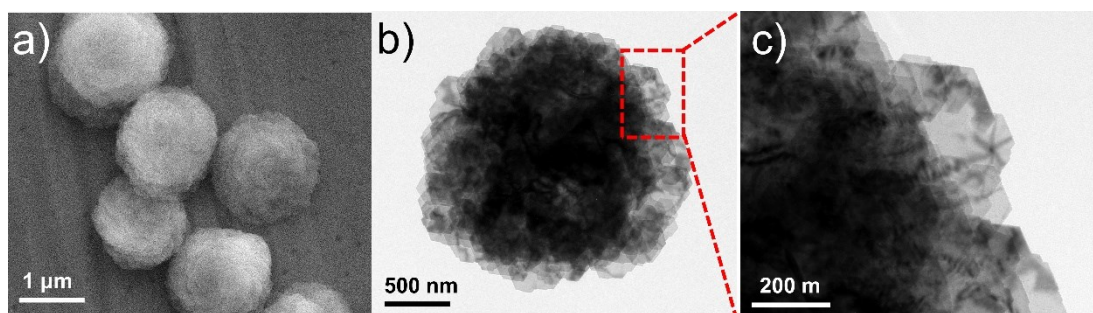


Fig. S2 (a) SEM and (b-c) TEM images of SnSe₂-36h sample.

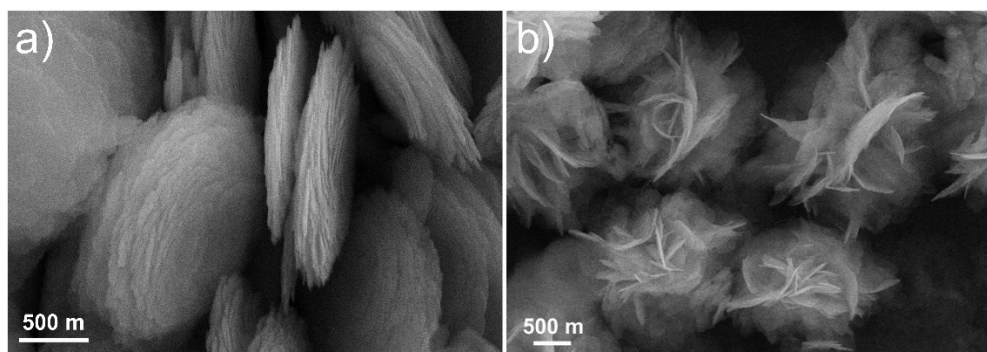


Fig. S3 SEM images of (a) SnSe₂-48h and (b) SnSe₂-60h samples.

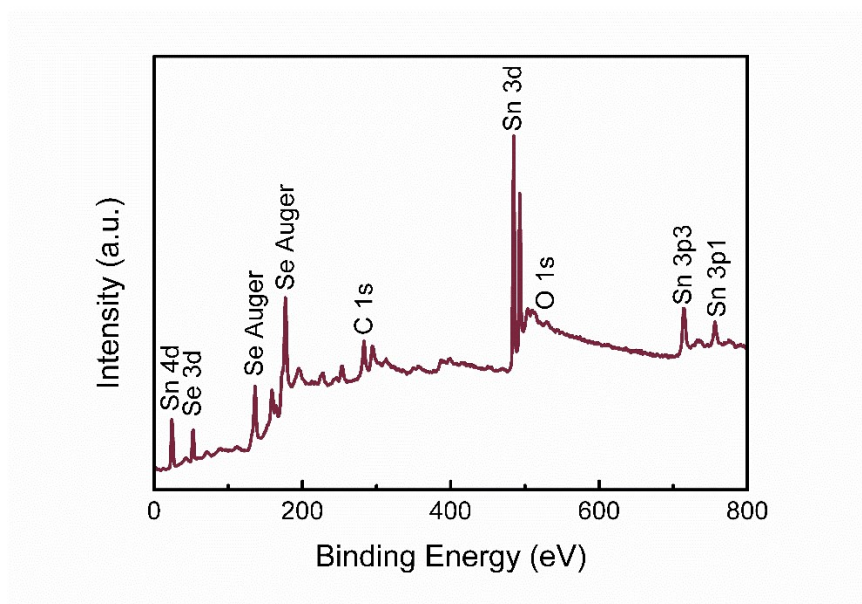


Fig. S4 Survey XPS spectrum of the SnSe₂ hierarchical nanostructures.

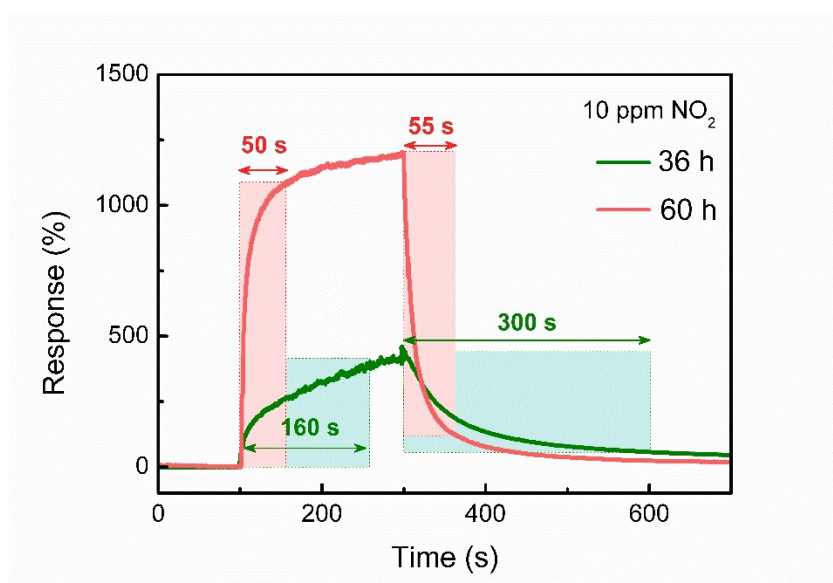


Fig. S5 Response/recovery curves of SnSe₂-36h and SnSe₂-60h to 10 ppm NO₂.

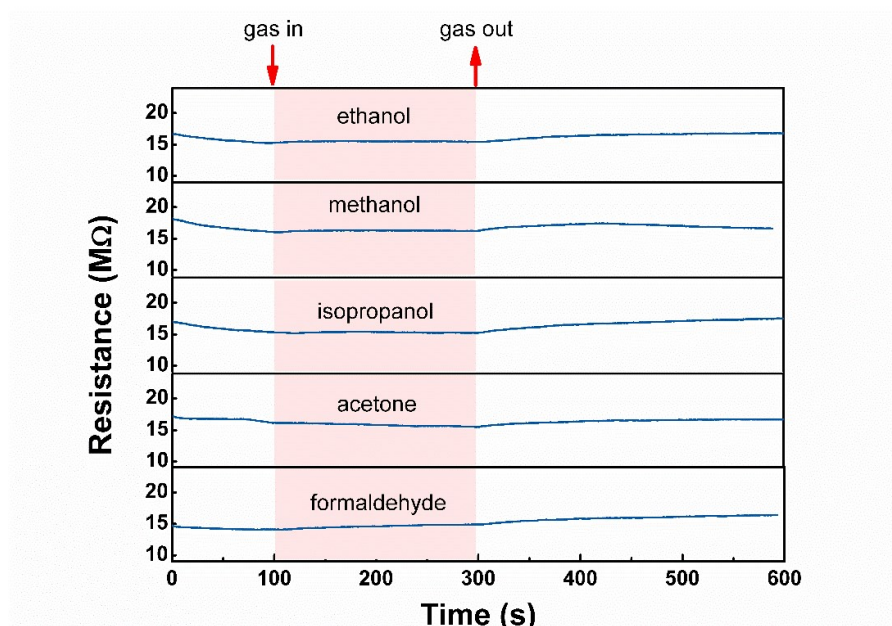


Fig. S6 Selectivity response of SnSe₂ sensor toward 100 ppm VOCs (ethanol, methanol, isopropanol, acetone, and formaldehyde).

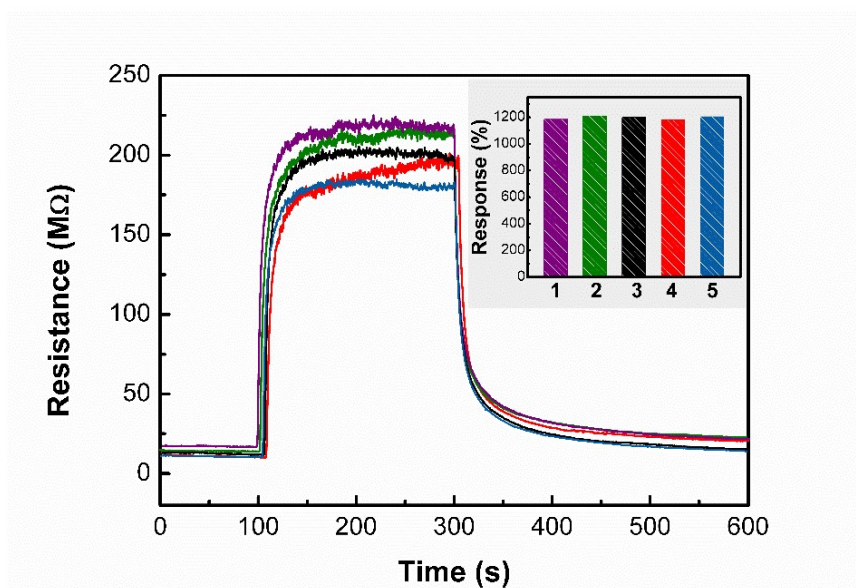


Fig. S7 The resistance variations and sensing response (inset) of the SnSe₂ hierarchical structures toward 10 ppm NO₂ on 5 different sensing devices.

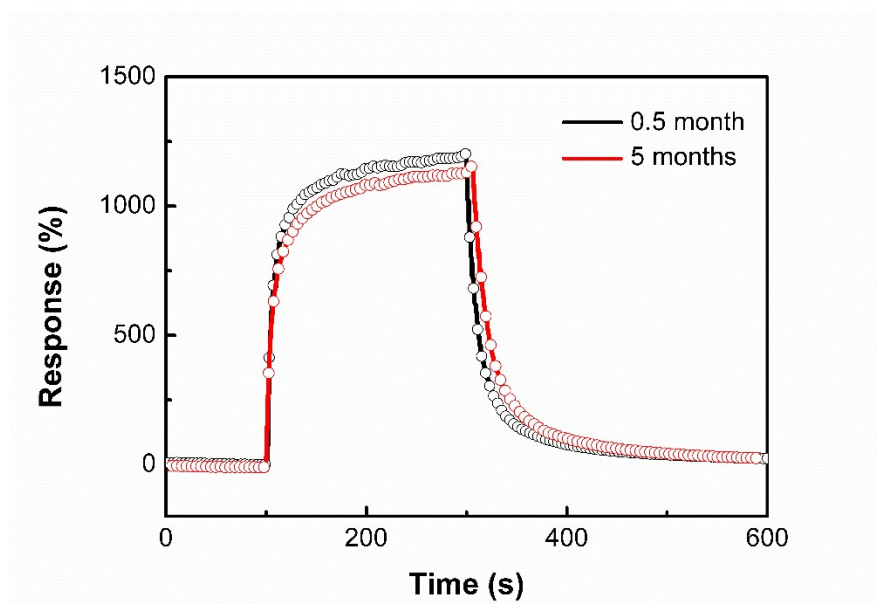


Fig. S8 The response and recovery curve of the SnSe₂ sensor after aging 0.5 month and 5 months to 10 ppm NO₂ at room-temperature.

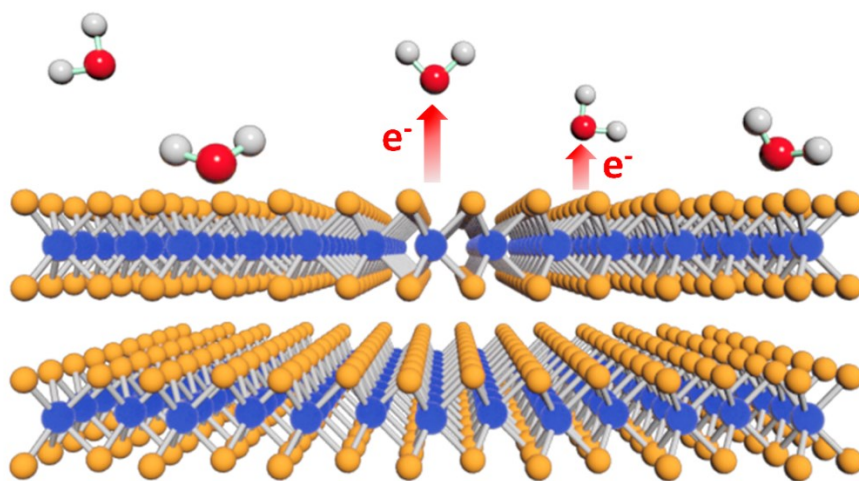


Fig. S9 Sensing mechanism of SnSe₂ exposed to NO₂.

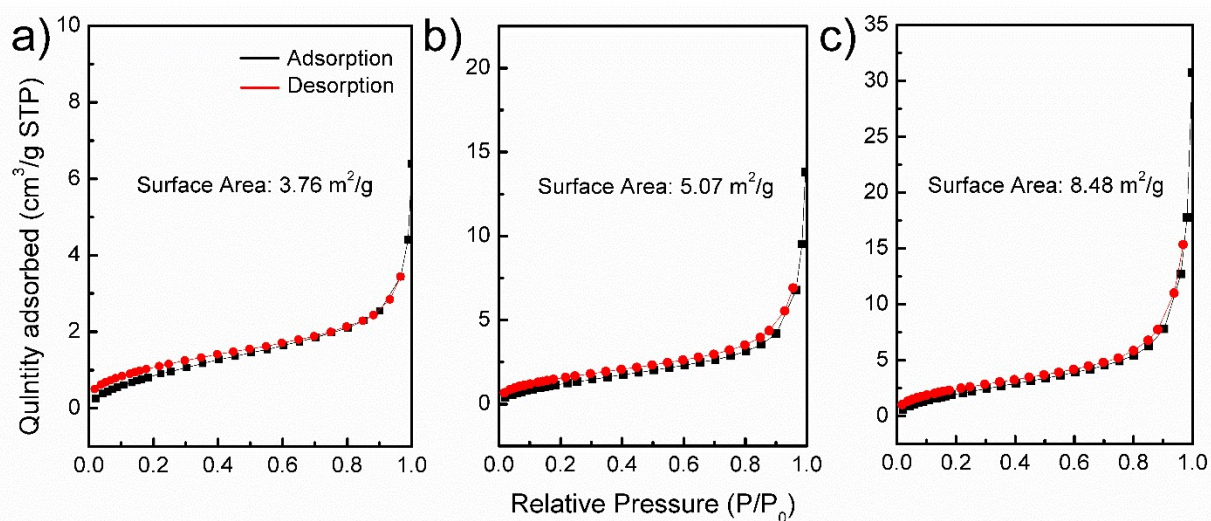


Fig. S10 Nitrogen adsorption/desorption isotherms of (a) SnSe_2 -36h, (b) SnSe_2 -48h and (c) SnSe_2 -60h samples.

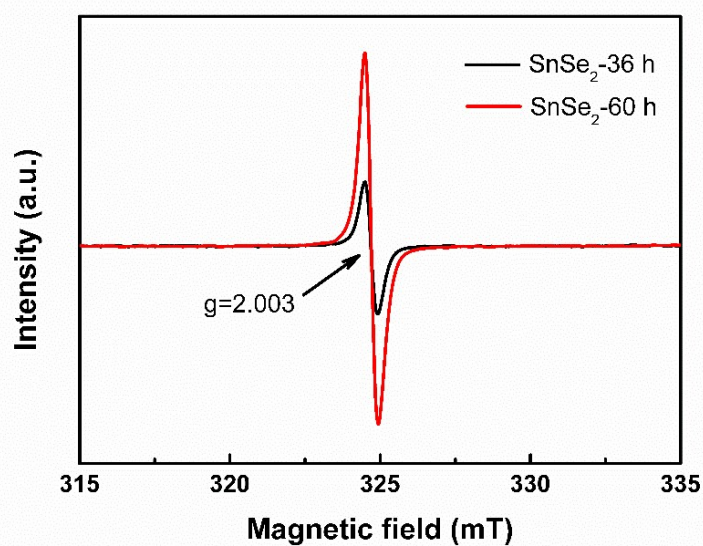


Fig. S11 EPR spectra of SnSe_2 -36h and SnSe_2 -60h samples.

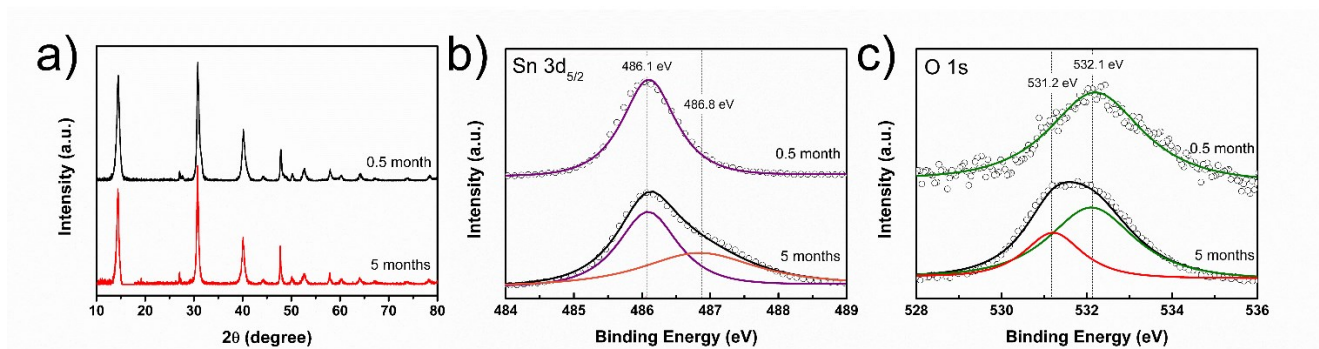


Fig. S12 (a) XRD patterns and XPS spectra of (b) Sn 3d orbital and (c) O 1s orbital of the SnSe₂ sensor after aging 0.5 month and 5 months.

Two peaks in the Sn 3d_{5/2} spectrum can be seen at 486.1 and 486.8 eV, belonging to the Sn–Se bond of SnSe₂ and Sn–O bond of SnO₂, respectively.^{1,2} The peak at 532.1 eV in the O 1s spectra can be attributed to the chemically adsorbed oxygen,³ and the peak at 531.2 eV can be correlated to the Sn–O–Sn lattice oxygen.⁴ These results indicate that SnSe₂ is slightly oxidized after 5 months.

References

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