Supporting Information

Dual selective gas sensing characteristics of 2D α-MoO_{3-x}, via a facile transfer process

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S1. The transfer of MoO_{3-x} on PDMS and Kapton substrates:

The transfer process can be applied to realize pristine MoO_{3-x} on any arbitrary substrate. As a proof of concept, we have transferred the materials onto flexible substrates such as PDMS and Kapton. The optical images of the transferred MoO_{3-x} on PDMS and Kapton are presented in Figure S1a and b. Raman spectroscopy was utilized to confirm the compositional integrity of the transferred material. Raman spectra (Figure S1c and d) show the 820 cm^{-1} and 996 cm^{-1} characteristic Raman peaks of as-grown MoO_{3-x}.

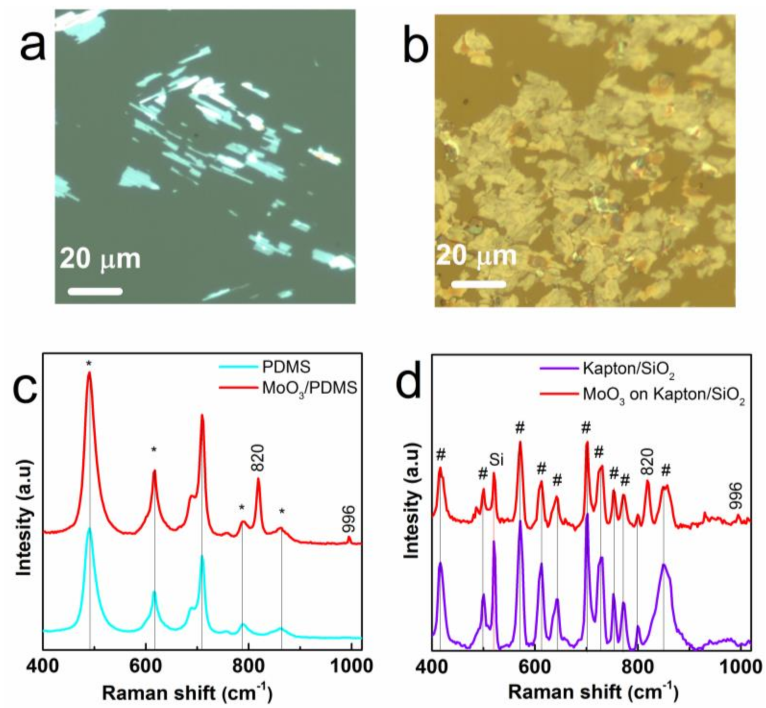

Figure S1. Transferred MoO_{3-x} on (a) PDMS and (b) Kapton substrates. Raman spectra of the transferred material on (b) PDMS and (d) Kapton. Raman peaks corresponding to PDMS and Kapton substrates are denoted by * and # respectively.

S2. Schematic illustration of the transfer process:

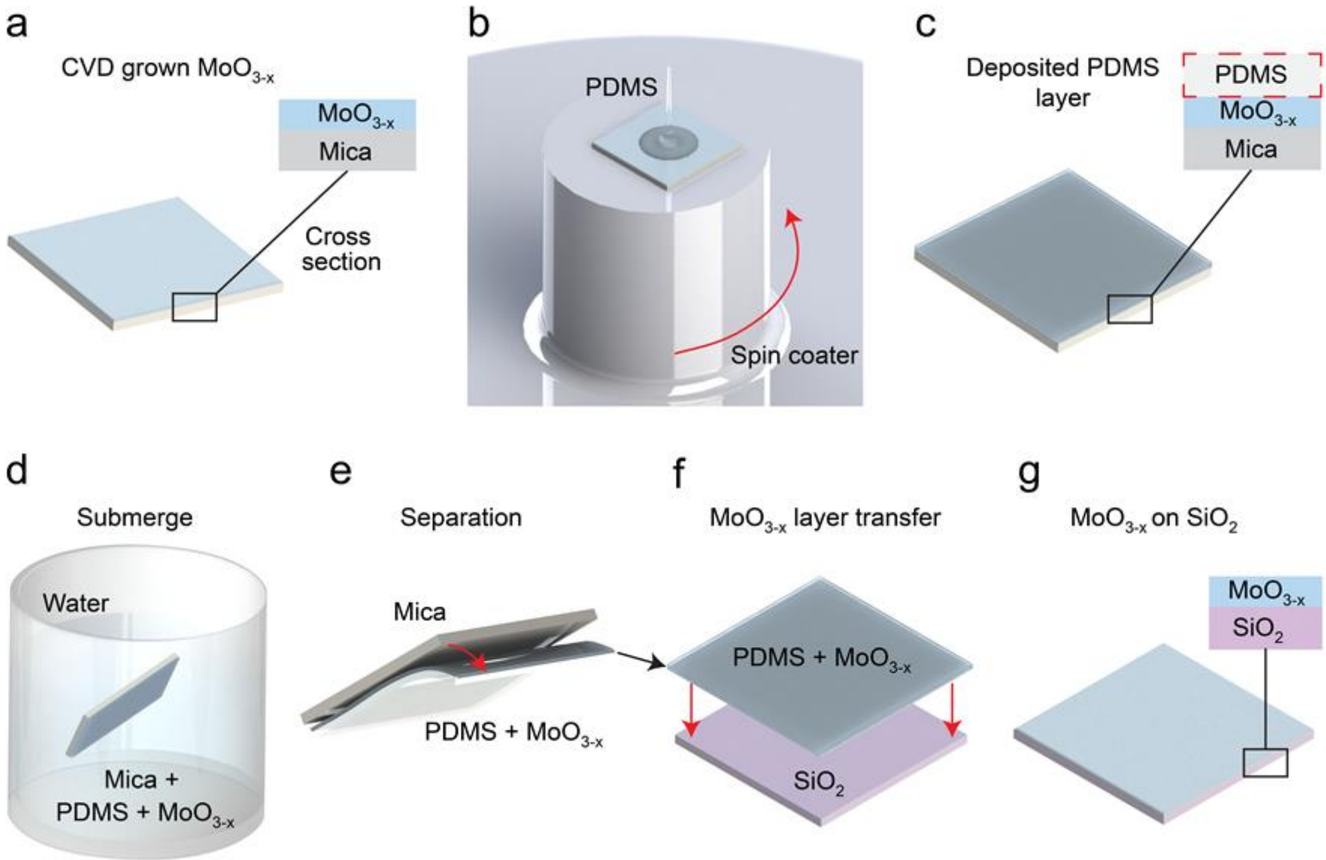

Figure S2. Schematic illustrating the method used to transfer the as-grown MoO_{3-x} crystals from mica to SiO_2.(a) CVD grown MoO_{3-x} on mica substrate (b) spin coating PDMS on MoO_{3-x}/mica (c) cured PDMS layer on top of MoO_{3-x}/mica layer (d) mica/PDMS/MoO_{3-x} layer submerged in to DI water (e) peeling off PDMS/MoO_{3-x} from mica (f) PDMS/MoO_{3-x} pressing on to SiO_2 for transferring MoO_{3-x} (g) transferred MoO_{3-x} on SiO_2

Table S1: NO_2 and H_2S sensing performance reports on various 2D materials in comparison to our work.

Structure	Synthesis	Concentration/ ppm	Operating Temperature/ ^0C	% Sensitivity $S = \frac{\lvert R_a - R_g \rvert}{R_a} \times 100\%$	Reference
2D MoS_2	CVD	10 ppm NO_2	100	16	S1
2D WS_2	ALD	25 ppm NO_2	RT	10	S2
2D SnS_2-rGO	Thermal reduction and wet chemical	11.9 ppm NO_2	80	56.8	S3
2D MoO_{3-x}	CVD	10 ppm NO_2	250	56	Our work
quasi-2D Cu_2O/SnO_2	Electrochemical	50 ppm H_2S	RT	45	S4
2D MoO_{3-x}	CVD	50 ppm H_2S	250	81	Our work

S3. Response and recovery of the devices at various concentrations of NO_2 and H_2S gases:

The gas sensing performance of the MoO_{3-x} sensor was assessed towards NO_2 and H_2S gases with concentrations ranging from 0.5 ppm to 10 ppm and 1 ppm to 50 ppm respectively, at the optimum temperature of 250 ^{0}C.

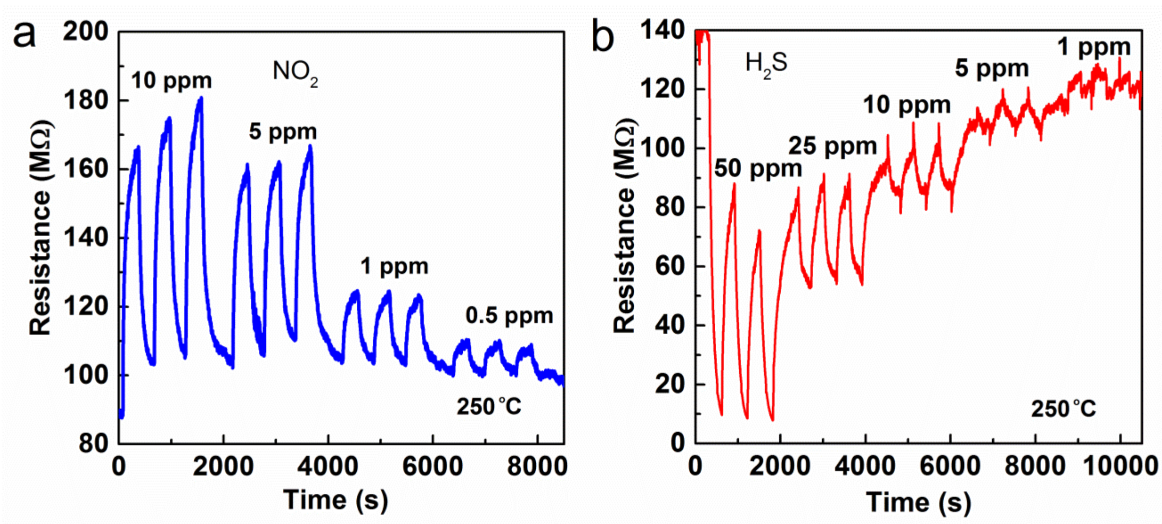

Figure S3. Gas sensing response with different concentration of (a) NO_2 and (b) H_2S gas.

S4. Long-term performance stability of the sensors:

Figure S4 presents the cyclic stability of the MoO_{3-x} based sensors tested over an extended period of time.

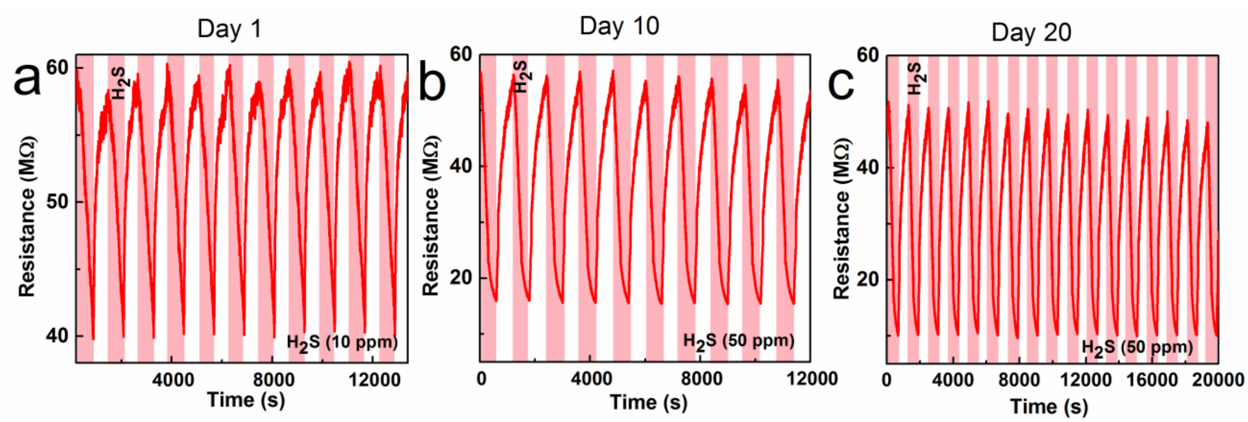

Figure S4. Long-term stability of the MoO_{3-x} based sensors towards (a) 10 ppm (b) and (c) 50 ppm of H_2S at 250 °C.

References

(S1) Cho, B.; Hahm, M. G.; Choi, M.; Yoon, J.; Kim, A. R.; Lee, Y.-J.; Park, S.-G.; Kwon, J.-D.; Kim, C. S.; Song, M.; Jeong, Y.; Nam, K.-S.; Lee, S.; Yoo, T. J.; Kang, C. G.; Lee, B. H.; Ko, H. C.; Ajayan, P. M.; Kim, D.-H., Charge-Transfer-Based Gas Sensing using Atomic-Layer MoS_2. *Sci Rep* **2015,** *5*, 8052.

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