ADVANCED FUNCTIONAL MATERIALS

Supporting Information

for *Adv. Funct. Mater.*, DOI: 10.1002/adfm.201601562

High Surface Area MoS_2/Graphene Hybrid Aerogel for Ultrasensitive NO_2 Detection

*Hu Long, Anna Harley-Trochimczyk, Thang Pham, Zirong Tang, Tielin Shi, Alex Zettl, Carlo Carraro, Marcus A. Worsley, and Roya Maboudian**

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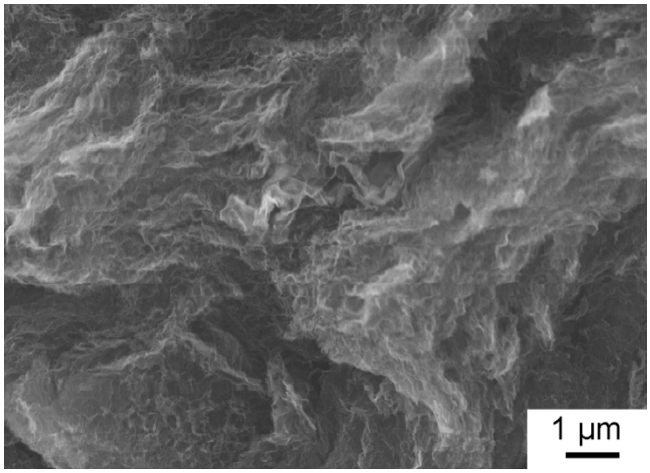

Figure S1. SEM image of the bare graphene aerogel.

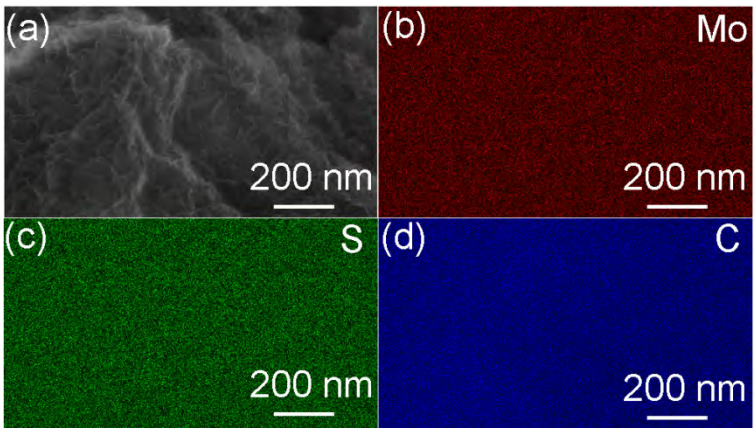

Figure S2. SEM image of the hybrid aerogel and the EDX maps of (e) Mo, (f) S, and (g) C showing uniform distribution of all three elements.

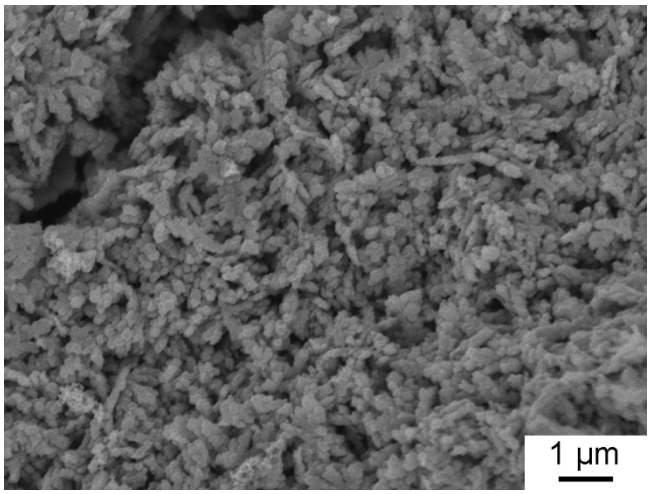

Figure S3. SEM image of the MoS_2 aerogel.

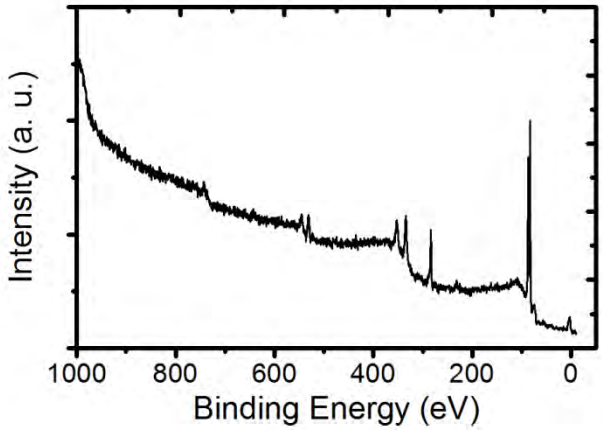

Figure S4. Full wide-scan XPS spectrum of the MoS_2/GA hybrid aerogel.

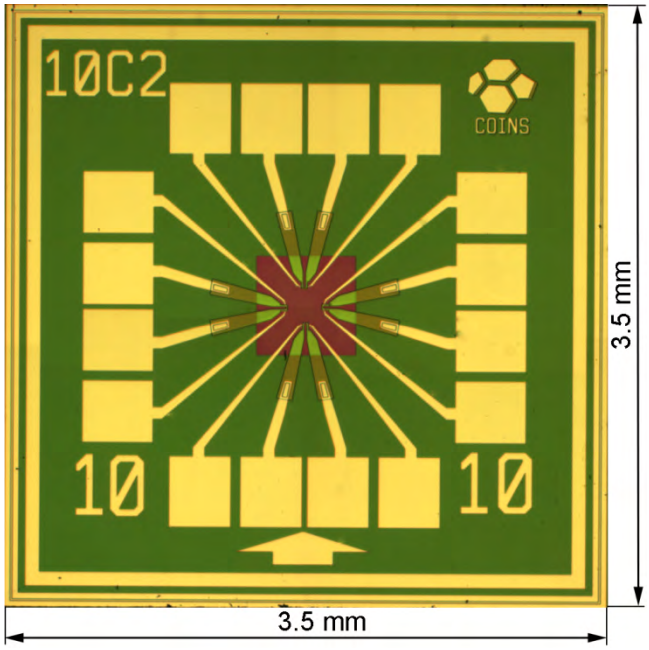

Figure S5. Optical image of a 3.5 mm × 3.5 mm chip containing four microheaters.

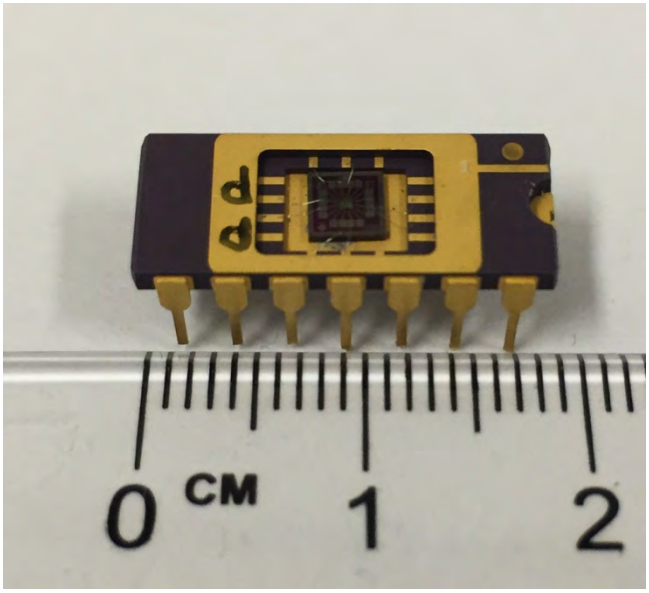

Figure S6. Digital image of microheater sensor that has been wire-bonded into a 14-pin ceramic dip package.

Table S1. Sensing performance of MoS_2 and graphene sensors to gases as reported in the literature and the present work

Materials	Sensing Temperature [°C]	Response Time [s]	Recovery Time [s]	NO_2 Detection Limit [ppb]	Power Consumption [mW]
Single layer graphene[a)]	250	26	480	500	—
2 nm MoS_2 film[b)]	25	3600	3600	500	—
5-layer MoS_2[c)]	25	250	500	100,000	15
Atomic thin MoS_2[d)]	25, 100	—	—	1500	—
Atomic thin MoS_2[e)]	25	—	—	120	—
Single-layer MoS_2[f)]	200	660	720	20	—
3D graphene foam[g)]	130	300	—	20,000	—
This work	200	21.6	29.4	14	4

[a)] H. Choi, J. S. Choi, J. Kim, J. Choe, K. H. Chung, J. Shin, J. T. Kim, D. Youn, K. Kim, J. Lee, S. Choi, P. Kim, C. Choi, Y. Yu, *Small* **2014**, *10*, 3685.; [b)] Q. He, Z. Zeng, Z. Yin, H. Li, S. Wu, X. Huang, H. Zhang, *Small* **2012**, *8*, 2994. [c)] D. J. Late, Y.-K. Huang, B. Liu, J. Acharya, S. N. Shirodkar, J. Luo, A. Yan, D. Charles, U. V. Waghmare, V. P. Dravid, C. N. R. Rao, *ACS Nano* **2013**, *7*, 4879. [d)] B. Cho, M. G. Hahm, M. Choi, J. Yoon, A. R. Kim, Y.-J. Lee, S.-G. Park, J.-D. Kwon, C. S. Kim, M. Song, Y. Jeong, K.-S. Nam, S. Lee, T. J. Yoo, C. G. Kang, B. H. Lee, H. C. Ko, P. M. Ajayan, D.-H. Kim, *Sci. Rep.* **2015**, *5*, 08052. [e)] B. Cho, A. R. Kim, Y. Park, J. Yoon, Y.-J. Lee, S. Lee, T. J. Yoo, C. G. Kang, B. H. Lee, H. C. Ko, D.-H. Kim, M. G. Hahm, *ACS Appl. Mater. Interfaces*, **2015**, *7*, 2952. [f)] M. Donarelli, S. Prezioso, F. Perrozzi, F. Bisti, M. Nardone, L. Giancaterini, C. Cantalini, L. Ottaviano, *Sens Actuators B*, **2015**, *207*, 602. [g)] R. Samnakay, C. Jiang, S. L. Rumyantsev, M. S. Shur, A. A. Balandin, *Appl. Phys. Lett.* **2015**, *106*, 023115.