

Supplementary information

**Synthesis and trimethylamine sensing properties of spherical
 V_2O_5 hierarchical structures**

Dongxue Wang, Kuikun Gu, Qi Zhao, Chengbo Zhai, Tianye Yang, Qing Lu, Jing Zhang and Mingzhe Zhang**

State Key Laboratory of Superhard Materials, Jilin University, Changchun 130012, People's Republic of China.

E-mail address: zhangmz@jlu.edu.cn, zhangjing628@jlu.edu.cn

XRD pattern of the precursor, and the as-obtained samples annealing of 350°C and 400°C.

The precursor is VOOH phase^{1, 2} and the sample annealing of 400°C has better crystallinity than the sample annealing of 350°C.

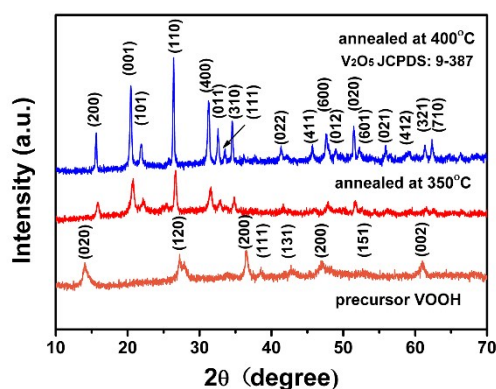


Fig. S1. XRD pattern of the precursor, and the as-obtained samples annealing of 350°C and 400°C.

1. W. C. Z., X. Y., L. L. Y., H. S. Q. and O. C. Z., *Advanced Materials*, 2006, **18**, 1727-1732.
2. Y. Bai, P. Jin, S. Ji, H. Luo and Y. Gao, *Ceramics International*, 2013, **39**, 7803-7808.

Determination of specific surface area

Nitrogen adsorption and desorption isotherms and corresponding BJH (Barrett–Joyner–Halenda) pore-size distribution of the spherical V₂O₅ are shown in **Fig. S2**. The BET surface area of the product was calculated to be 7.78 m²/g using the BET (Brunauer–Emmett–Teller) method, according to IUPAC classification, spherical V₂O₅ shows a type III isotherm. The inset of **Fig. S2** indicates that the pore size of obtained product is 2-30 nm.

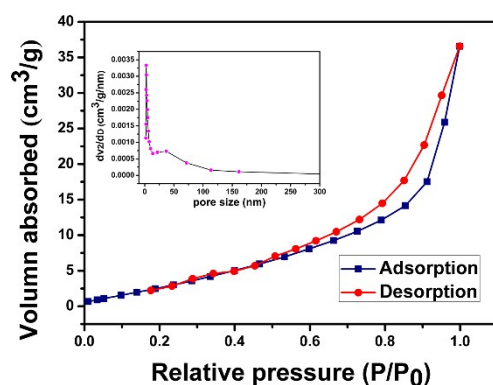


Fig. S2. N₂ adsorption–desorption isotherm of the spherical V₂O₅ sample. The inset shows the corresponding pore size distribution obtained from the adsorption curve.

Supplementary dynamic resistance cures

In the **Fig. S3**, the resistance of spherical V₂O₅ sensor can nearly restore its initial value at 240°C, and the response values are very close in the range of 180°C to 280°C and reach a maximum at 180°C. However, the sensor based on spherical V₂O₅ samples slowly recover its resistance at temperature 180°C.

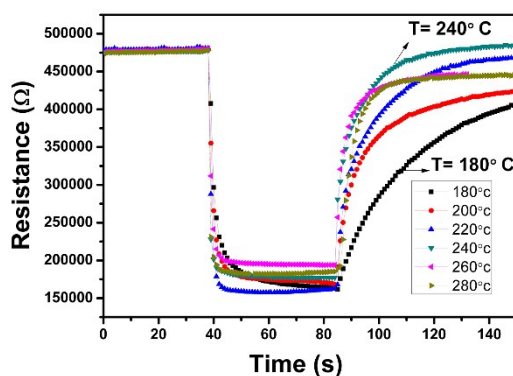


Fig. S3. The response cures of the sensor based on V₂O₅ to 100 ppm TMA at 180°C, 200°C, 220°C, 240°C, 260°C and 280°C respectively.

The morphologies and gas sensitivity of the sample annealing of 350°C, 400°C and 450°C

In the **Fig. S4**, the sample annealing of 350°C and 400°C have similar morphology, but the morphology of the sample annealing of 450°C has been changed. And the sensor based on the sample annealing of 400°C shows the higher response ($S=2.8$) than the sample annealing of 350°C ($S=2.35$) and 450°C ($S=2.13$) to 100 ppm TMA.

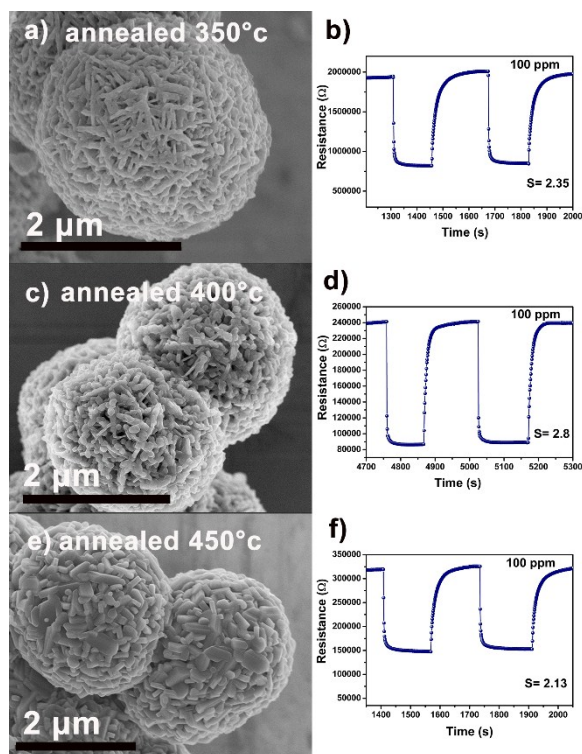


Fig. S4. (a), c) and e)) the morphologies of the sample annealing of 350°C, 400°C and 450°C; (b), d) f)) the response curve of the sample annealing of 350°C, 400°C and 450°C respectively.