

Gas Sensing Properties of CuSbS₂ Quantum Dots/rGO Composites towards Ammonia at Room Temperature

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Abstract:

The reduced graphene oxide (rGO) has drawn much attention as the sensing material in the field of gas detection[1]. However, there are still some challenges for their application because of their poor stability and selectivity. Therefore, it is particularly significant for the surface modify of rGO. As a new ternary semiconductor with the direct bandgap, CuSbS₂ quantum dots (QDs) have many special advantages, such as large specific surface area, tunable band-gap, high carrier mobility, and so on. Those characters enable CuSbS₂ QDs to be applied to enhance the gas sensing properties of rGO [2]. In the present work, CuSbS₂ QDs/rGO composites were prepared by a hot injection method with the even size distribution. The gas sensing properties of the composites were tested by a static measurement system. The results show that the detection limit of the composites towards NH₃ is 1 ppm at room temperature with a good gas selectivity, which proves that the gas sensing properties of the composites is enhanced substantially compared with pure CuSbS₂ quantum dots and rGO. The contribution of sunlight irradiation is also revealed to enhance gas response of the composites. The excellent gas sensing properties of the composites are mainly due to the obvious synergistic effect between rGO and CuSbS₂ quantum dots. The low detection limit at room temperature indicates that CuSbS₂ QDs/rGO composites are expected to be a good candidate of the gas sensing material in NH₃ detection.

Key words: rGO, CuSbS₂ quantum dots, NH₃, room temperature, gas sensing properties

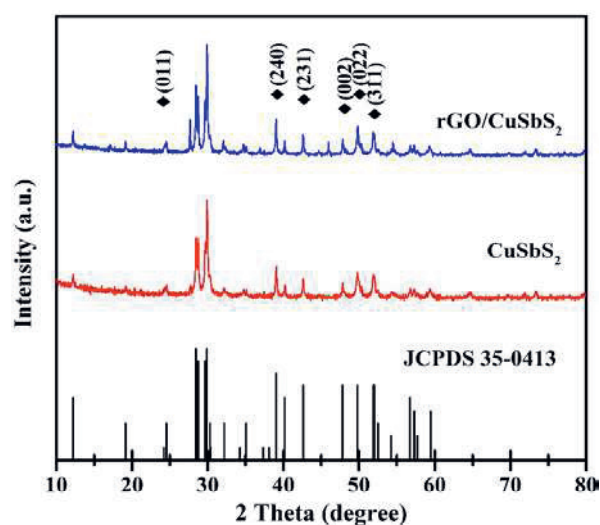


Fig. 1. XRD spectra of CuSbS₂ QDs and CuSbS₂ QDs/rGO composites.

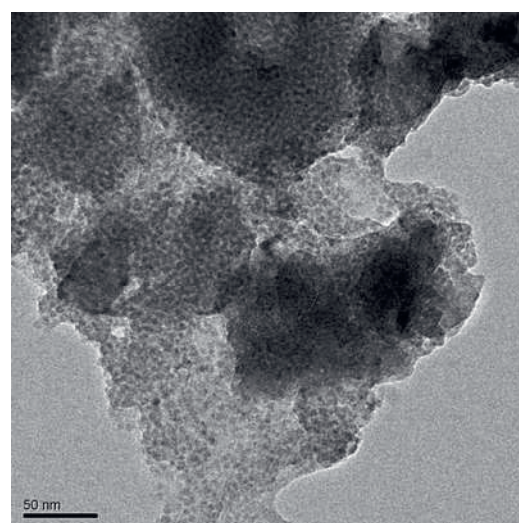


Fig. 2. HRTEM image of CuSbS₂ QDs/rGO composites.

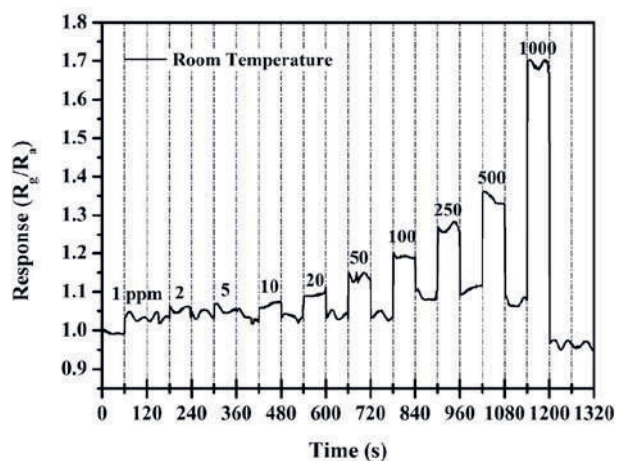


Fig. 3. Sensing performance of CuSbS_2 QDs/rGO composites towards ammonia with various concentrations at room temperature.

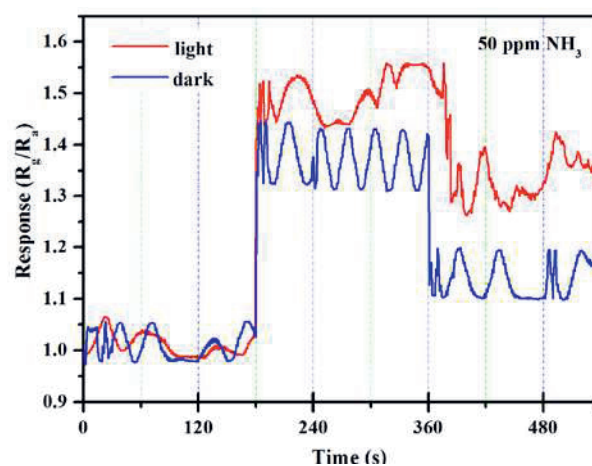


Fig. 4. The influence of light irradiation on sensing performance of CuSbS_2 QDs/rGO composites towards ammonia at room temperature.

References

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