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Ultra-Thin $ZnFe_2O_4$ Nanosheets-Decorated ZnO Hollow Nanofibers for High Sensitive Acetone Sensor

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Abstract:

Heterostructures may exhibit not only a combination of properties from the individual component but also enhanced properties arising from the synergistic effects between the components[1]. In this study, a multi-step strategy for constructing $ZnO/ZnFe_2O_4$ hollow nanofibers with double-shell architectures was presented. The preparation of ZnO hollow nanofiber included the first preparation of PVP nanofiber through electrospinning as an hard template and then growth of ultrathin ZnO layer through atomic layer deposition (ALD) method with subsequent annealing process. Subsequently, the growth of the ultrathin $ZnFe_2O_4$ nanosheets (ca.10 nm) on the ZnO outer surface was carried out at room temperature via solution reactions in order to generate heterostructures and large surface area. When evaluated as a novel sensing material for acetone (C_3H_6O) detection, the resultant tube-like $ZnO/ZnFe_2O_4$ heterostructures exhibited obviously enhanced sensing response, lower operating temperature as well as faster response/recover speed during the dynamic measurement compared to the bare ZnO hollow nanofiber, which endow these $ZnO/ZnFe_2O_4$ heterostructures with a potential application in gas sensing.

Key words: $ZnO/ZnFe_2O_4$, heterostructure, gas sensor, hollow nanofiber, ALD

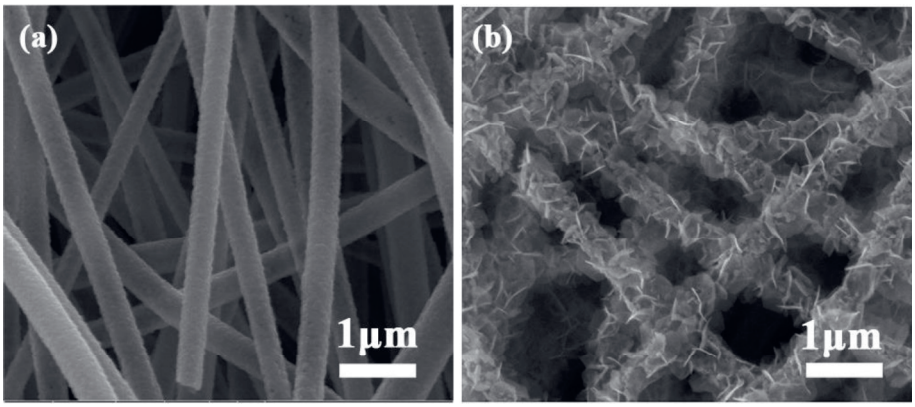

Fig. 1. SEM images of (a) bare ZnO and (b) $ZnO/ZnFe_2O_4$ heterostructure.

References

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