

The role of Al_2O_3 interlayer in the synthesis of $\text{ZnS}/\text{Al}_2\text{O}_3/\text{MoS}_2$ and $\text{ZnS}/\text{Al}_2\text{O}_3/\text{TaSe}_2$ core-shell nanowires

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Abstract

Mixed dimensional 1D/2D or core-shell nanowires with layered van der Waals material shell are intriguing type of nanomaterials, which allows to construct materials with multiple functional properties.

During the synthesis of such heterostructured nanomaterials, unwanted structural and morphological changes in nanostructures may occur, especially when multiple sequential growth steps are involved. In this study, we describe two different synthesis strategies of heterostructured $\text{ZnS}/\text{Al}_2\text{O}_3/\text{TaSe}_2$ (Figure 1) and $\text{ZnS}/\text{Al}_2\text{O}_3/\text{MoS}_2$ (figure 2) core-shell nanowires (NWs), and explore the role of the Al_2O_3 interlayer during synthesis [1, 2].

A reported strategy of the Al_2O_3 interlayer insertion can be used for the synthesis of other core-shell NWs with a transition metal dichalcogenides (TMDs) shell to protect the NW core material that may otherwise be altered or damaged by the reactive chalcogenides at high temperatures.

References

[1] B. Polyakov, K. Kadiwala, E. Butanovs, L. Dipane, A. Trausa, D. Bocharov, S. Vlassov, *ChemEngineering* 8 (2024) 25.

[2] E. Butanovs, A. Kuzmin, A. Zolotarjovs, S. Vlassov, B. Polyakov, *Journal of Alloys and Compounds* 918 (2022) 165648.

Figures

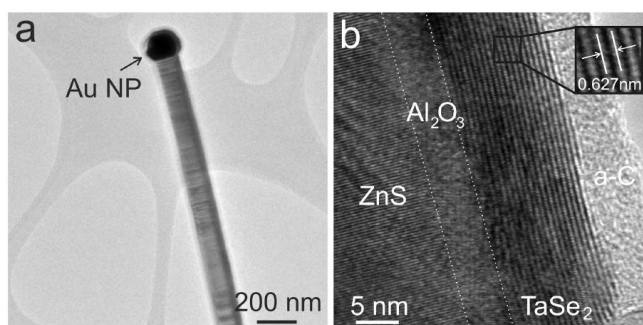


Figure 1: TEM images of $\text{ZnS}/\text{Al}_2\text{O}_3/\text{TaSe}_2$ NW at different magnifications [1].

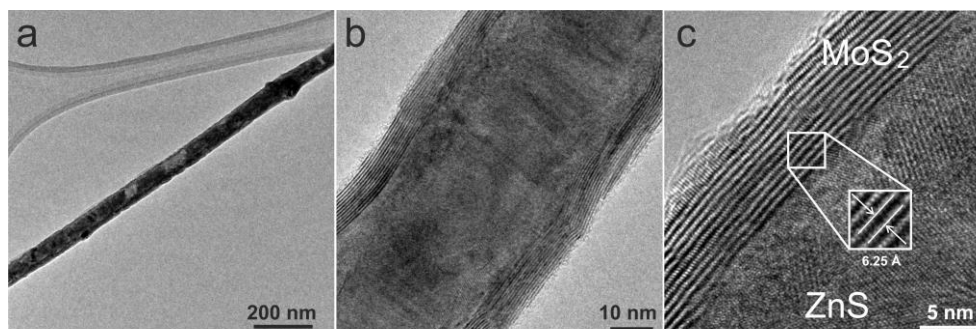


Figure 2: TEM images of $\text{ZnS}/\text{Al}_2\text{O}_3/\text{MoS}_2$ NW at different magnifications [2].