

Supplementary Materials: Ni₃Se₄@MoSe₂ Composites for Hydrogen Evolution Reaction

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Heading

3.1. Synthesis and Structural Characterization

The morphologies and structures of the Ni₃Se₄ and Ni₃Se₄-MoSe₂ composites with different amounts of Ni₃Se₄ were characterized by FE-SEM and TEM. Figures 4 shows the FE-SEM and TEM images of pure Ni₃Se₄ and Ni₃Se₄-MoSe₂ composites with a ratio of 1:2. The pure Ni₃Se₄ nanosheets were observed to be aggregated and formed clusters with large surface areas, as shown in Figure 4a. Figure 4b shows the high-resolution transmission electron microscopy (HRTEM) image of Ni₃Se₄ nanosheets with a lattice fringe of 0.27 nm, which was assigned to the (112) plane [48]. By in situ synthesis, uniform flower-like MoSe₂ nanosheets could be grown on Ni₃Se₄ nanosheets (Figure 4c). The growth of vertical MoSe₂ nanoflowers was further confirmed by HRTEM (Figure 4d). Moreover, the EDX elemental mapping results shown (Supporting Information, Figure S1) revealed that MoSe₂ nanoflowers were dispersed uniformly on the surface of Ni₃Se₄. Further increasing the amount of Ni₃Se₄ in the Ni₃Se₄-MoSe₂ composites resulted in agglomeration of the composites (Supporting Information, Figure S2) and hinder the exposure of active edges of MoSe₂.

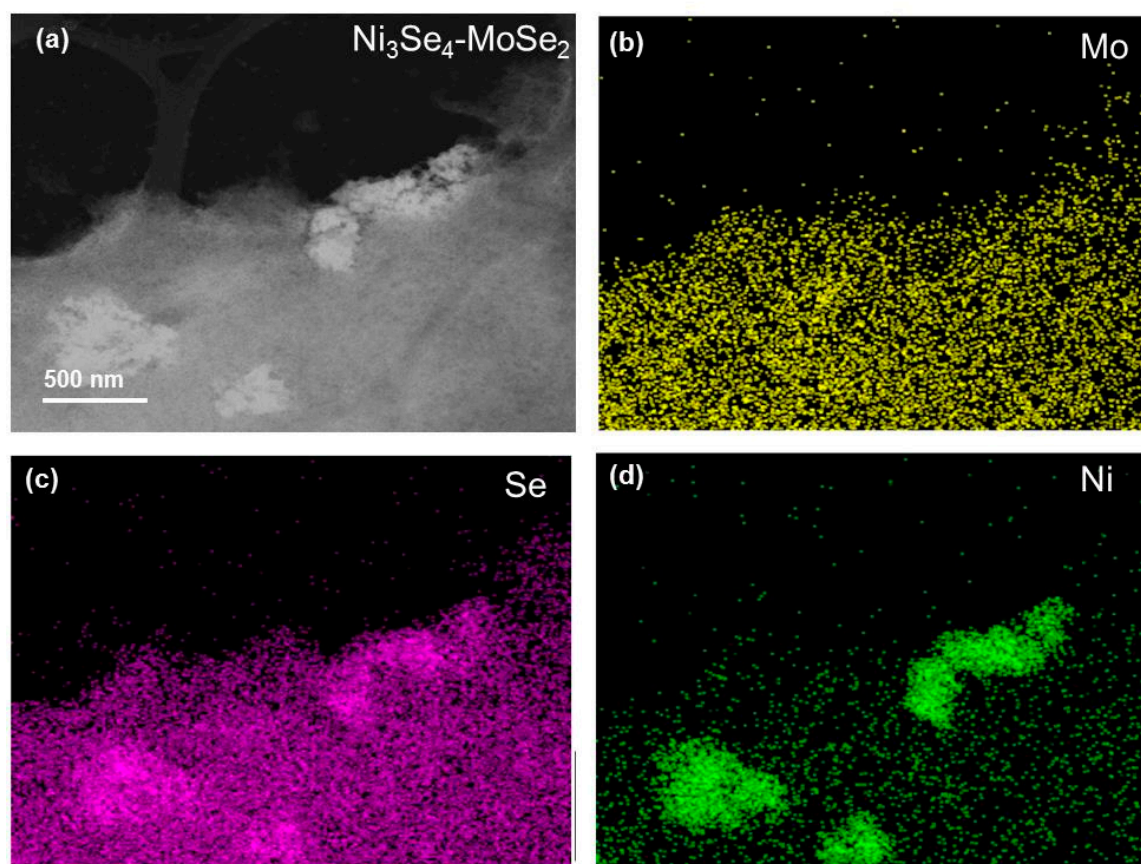


Figure S1. EDX spectra of Ni₃Se₄@MoSe₂

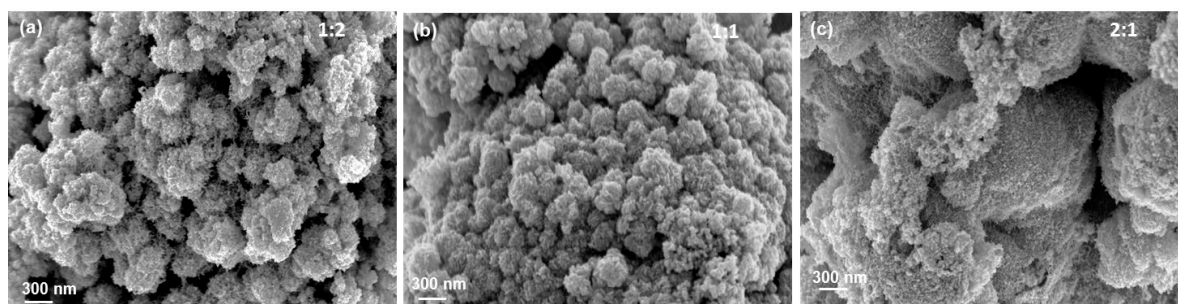


Figure S2. (a), (b), (c) SEM images of $\text{Ni}_3\text{Se}_4@\text{MoSe}_2$ with different $\text{Ni}_3\text{Se}_4:\text{MoSe}_2$ ratios of 1:2, 1:1, and 2:1, respectively.