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Solution-processed GaSe Nanoflake-based Films for Photoelectrochemical Water Splitting¹

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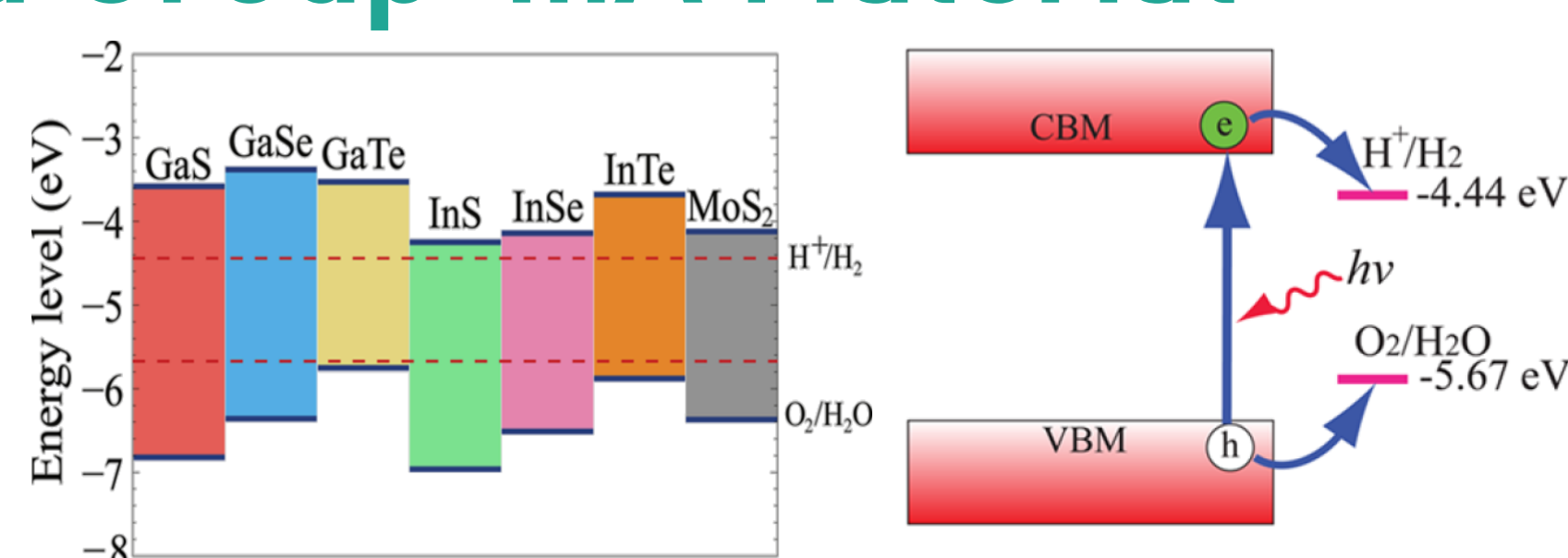
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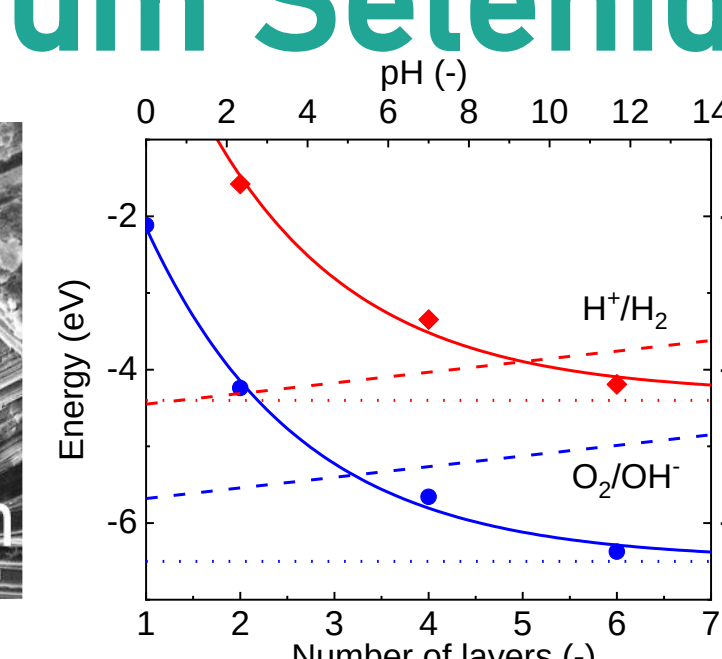
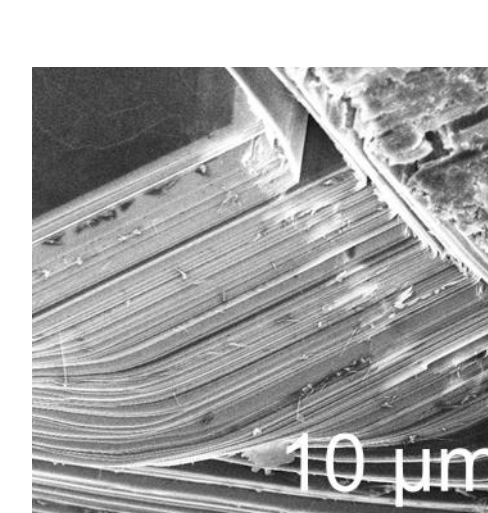
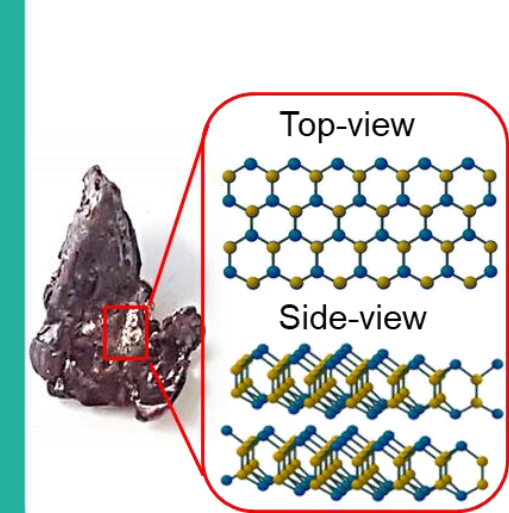
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2D Layered Group-III A Material²

Group-III compounds, MX (M = Ga, In; X = S, Se, Te), have been theoretically predicted to be promising water splitting photocatalysts.

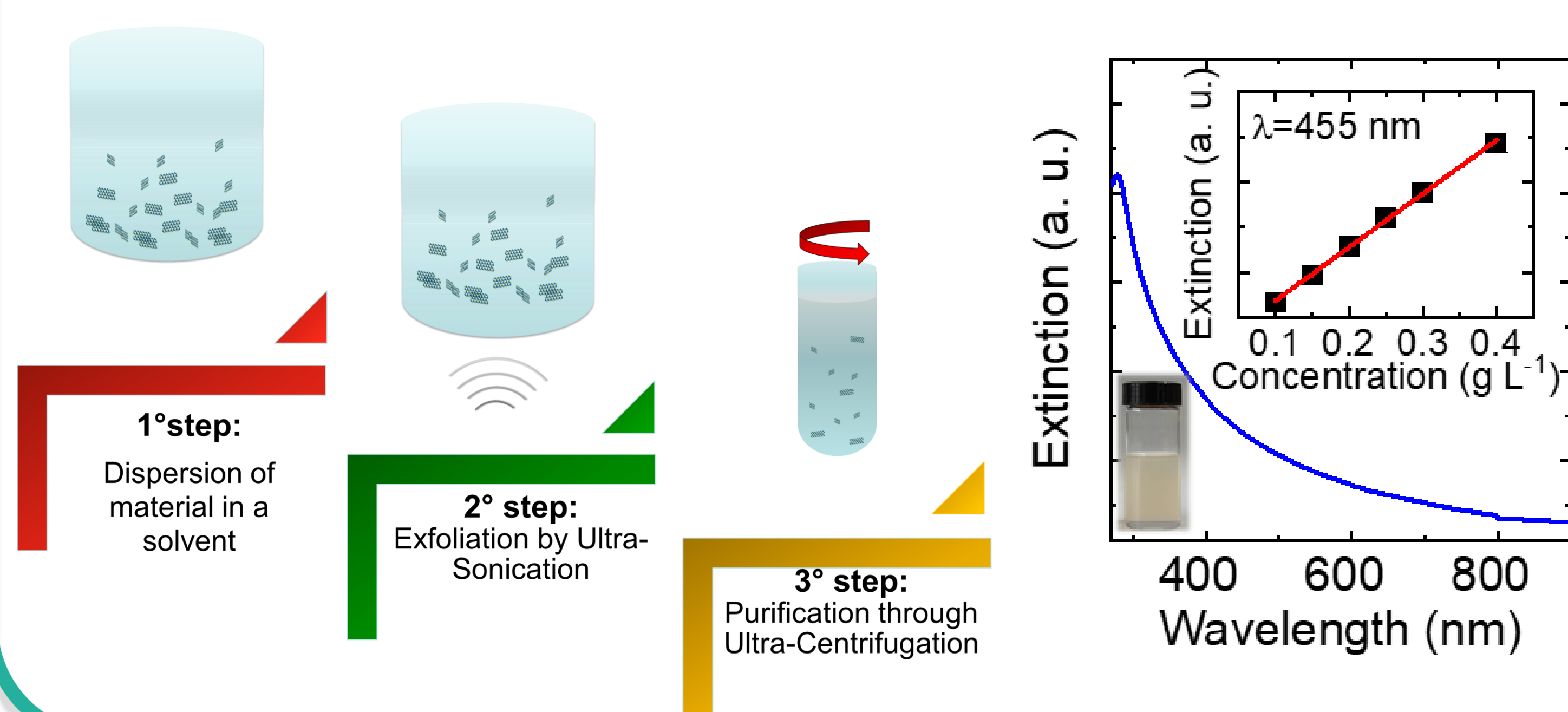


Gallium Selenide (GaSe)

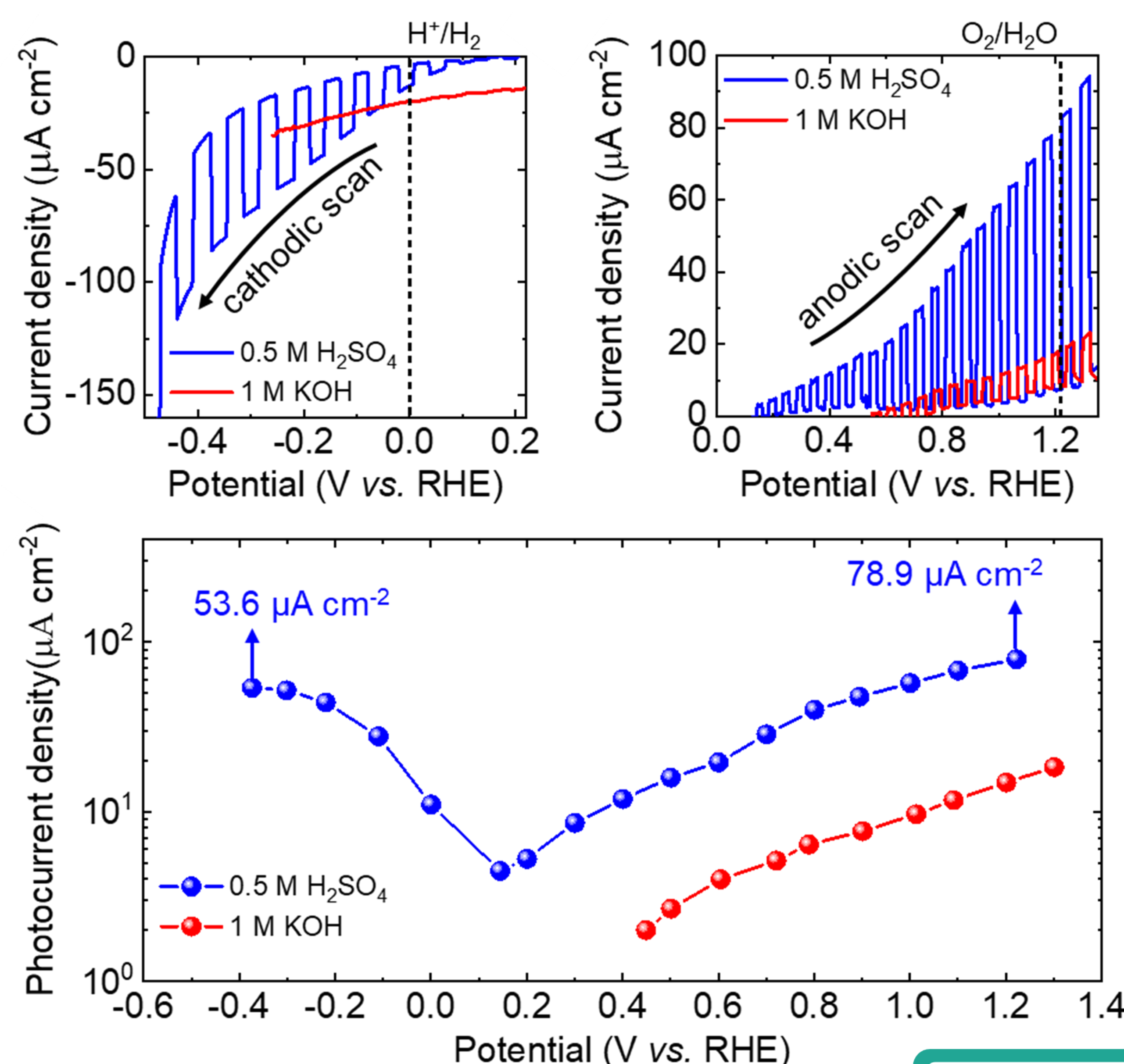
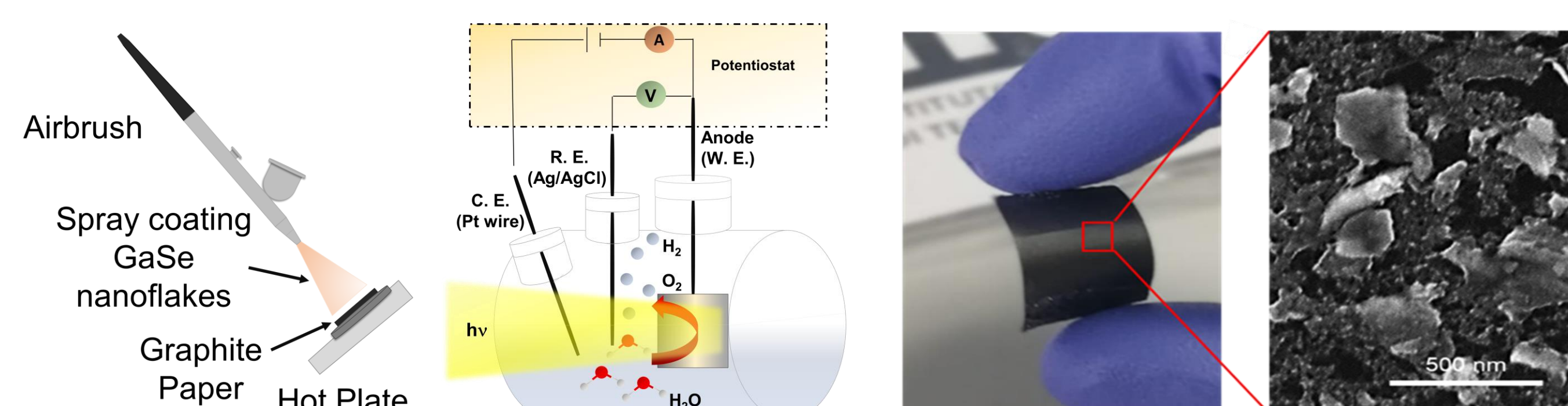


Depending on the number of the layers and the pH, GaSe nanoflakes can fulfill one or both the water splitting requirements, i.e., $E_{CBM} > E(H^+/H_2)$ and $E_{VBM} < E(O_2/H_2O)$

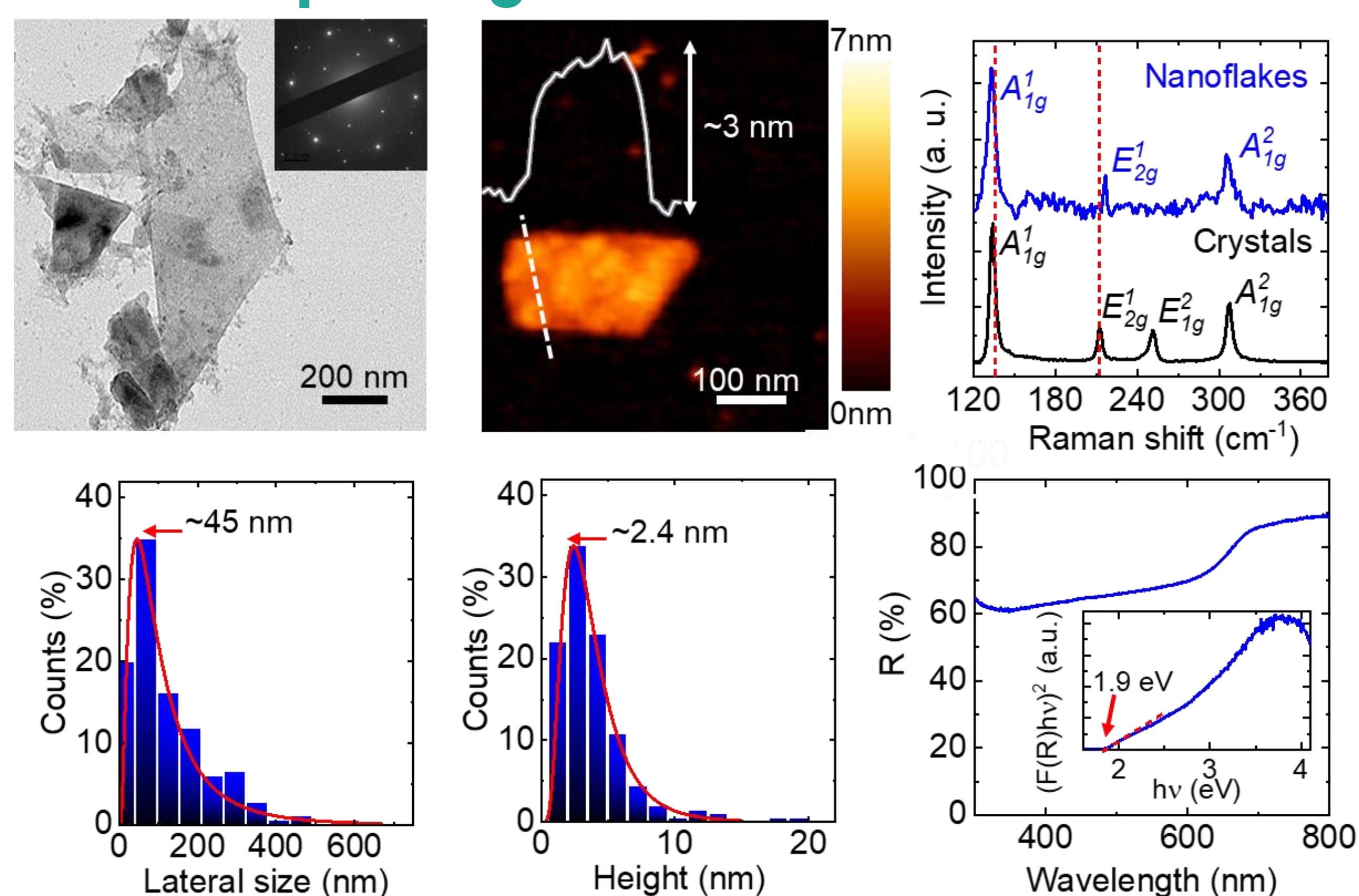
Liquid-phase Exfoliation (LPE) Process³



GaSe Electrode Fabrication and Electrochemical Characterization



Morphological Characterization



Conclusion

The GaSe photoelectrodes show the best PEC performance in 0.5 M H₂SO₄, reaching a cathodic photocurrent density at 0 V vs. RHE ($J_{0V \text{ vs RHE}}$) of $-9.3 \mu A cm^{-2}$, a ratiometric power-saved metric for HER ($\Phi_{\text{saved,HER}}$) of 0.09%, an anodic photocurrent density at +1.23 V vs. RHE ($J_{1.23V \text{ vs RHE}}$) of $83.4 \mu A cm^{-2}$ and a ratiometric power-saved metric for OER ($\Phi_{\text{saved,OER}}$) of 0.25%.



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