

# Preparation of Emerging 2D Materials and their Heterostructures by Electrochemistry

**Dr. Huanhuan Shi,**

Xinliang Feng, Matthieu Le Tacon

Karlsruher Institut für Technologie, Hermann-v.-Helmholtz-Platz 1

76344 Eggenstein-Leopoldshafen, Germany

[Huanhuan.Shi@kit.edu](mailto:Huanhuan.Shi@kit.edu)

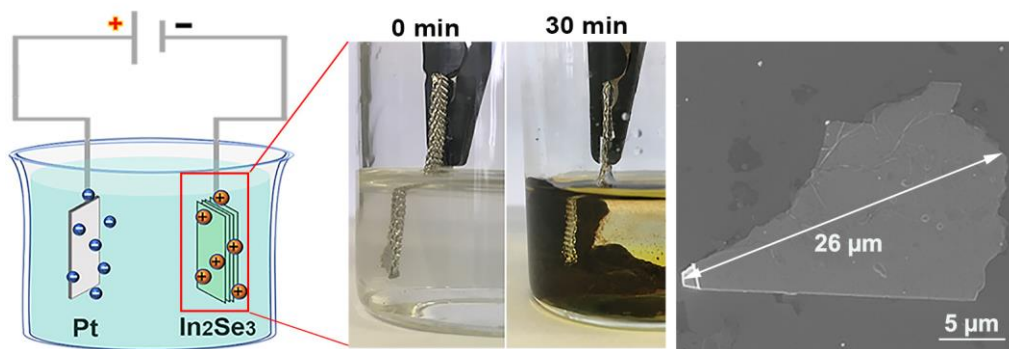
## Abstract

2D materials and their heterostructures have attracted tremendous research interest since their unique mechanical, electrical and optical properties hold great potential in novel applications for electronics and optoelectronics. High-throughput production of 2D materials and their vdWHs with high quality is a key to fundamental studies and especially industrial applications. Electrochemical intercalation has been proved a very promising approach that can delaminate the layered materials with high yield. Here we will show preparation of high-quality emerging 2D materials and their vdWHs by using electrochemical intercalation. At the end, the emerging trends, challenges, and opportunities in electrochemical intercalation are also highlighted.

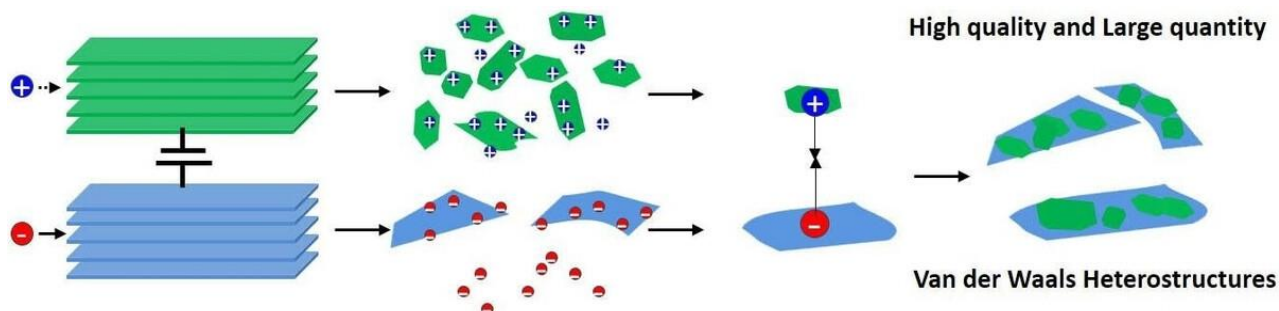
## References

- [1] **H. Shi**, M. Li, A. S. Nia, M. Wang, S. Park, Z. Zhang, M. R. Lohe, S. Yang, X. Feng, *Adv. Mater.* **2020**, 32, 1907244.
- [2] **H. Shi**, M. Li, S. Fu, C. Neumann, X. Li, W. Niu, Y. Lee, M. Bonn, H.I. Wang, A. Turchanin, A. Shaygan Nia, S. Yang, X. Feng, *Angew. Chem. Int. Ed.*, **2023**, 62, e202303929.
- [3] **H. Shi**, D Fuchs, M Le Tacon, **2024**, unpublished.

## Figures



**Figure 1:** Ultrafast electrochemical synthesis of defect-free  $\text{In}_2\text{Se}_3$  flakes.



**Figure 2:** High-throughput synthesis of van der Waals heterostructures through electrochemistry.