



Department of Materials Science and Engineering Seminar Series 2025

Low-Dimensional Chalcogenides for Electrocatalysis and Surface-Confined Crystal Growth

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Date and time: 5th November, 9.30am to 11.30am

Venue: S9 Level 9 Conference Room

Abstract

Low-dimensional chalcogenides, characterized by their van der Waals (vdW) layered structures, exhibit strong in-plane covalent bonding and weak interlayer interactions, enabling exfoliation into few-layer or monolayer forms. This structural versatility endows them with tunable electronic properties and high surface reactivity, offering great potential for electrocatalysis and surface-confined crystal growth.

This thesis focuses on the design and synthesis of chalcogenide nanostructures for the two-electron oxygen reduction reaction ($2e^-$ ORR) and confined material growth. First, tellurium (Te) and selenium (Se) nanobelts were prepared via electrochemical exfoliation, exhibiting basal-plane activity toward selective H_2O_2 production through the $2e^-$ ORR pathway, achieving nearly 100% selectivity and excellent stability. To further improve conductivity, Te and Se nanowires confined in multi-walled carbon nanotubes (MWCNTs) were synthesized, demonstrating enhanced charge transport and superior catalytic efficiency. Beyond catalysis, Pd diffusion in layered $MoTe_2$ and WTe_2 was exploited to achieve on-chip, surface-confined growth of quasi-2D non-layered compounds, directly visualized through in situ heating TEM.

Biography

Chang Meijuan received her B.Eng. degree in Materials Science and Engineering from Zhengzhou University in 2018 and M.Sc. degree from Fudan University in 2021. She is currently a Ph.D. candidate in the Department of Materials Science

and Engineering under the supervision of Prof. Kostya Novoselov. Her research focuses on the synthesis of low-dimensional chalcogenide materials and their applications in electrocatalysis and surface-confined crystal growth.

Please join us!

HOST: Asst. Prof. Zhu Di