

Faculty of Engineering

ASPIRE Summer Research Program 2026-2027

Project Title: Engineering Next-Generation 2D Perovskite Semiconductors for Emerging Optoelectronics

Supervisor(s): Dr Wenxin Mao

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Objective

The project aims to develop a reliable method for controlling the growth of high-quality two-dimensional perovskite single crystals. The student will investigate how growth parameters—including precursor concentration, solvent composition, temperature, cooling or evaporation rate, and crystallisation time—affect crystal size, thickness, morphology, and optical quality. By systematically varying these conditions, the project will identify an optimal growth window and establish clear relationships between synthesis conditions and crystal properties. The expected outcomes are a reproducible crystal-growth protocol, a practical parameter map for tuning crystal characteristics, and a set of well-characterised crystals suitable for future studies in optoelectronics, photodetectors, light-emitting devices, and fundamental semiconductor physics.

Project Details

The student will prepare perovskite precursor solutions and grow crystals using solution-based techniques such as controlled cooling, solvent evaporation, or antisolvent-assisted crystallisation. Crystal growth will be monitored and optimised through a structured experimental design. The resulting crystals will be examined using optical microscopy and, where available, techniques such as X-ray diffraction, photoluminescence spectroscopy, absorption spectroscopy, and atomic force microscopy. The student will compare growth conditions with structural and optical performance to determine which factors produce large, uniform, low-defect crystals. This project offers practical experience in materials synthesis, experimental design, semiconductor characterisation, and scientific data analysis.

Project Timeline

TASK	1	2	3	4	5	6	7	8	9	10
Literature review										
Precursor preparation										
2D single-crystal growth										
Microscopy and spectroscopy										
Growth–structure–property map										
Optimised growth protocol										
Final report preparation										

Prerequisites

Chemistry, Materials Science, Physics

Student Placement Agreement

A student placement agreement must be signed by the project supervisor and the student prior to commencement of the ASPIRE program.

[LV0554-72741 ASPIRE Program Co-Curricular-Student-Placement-Agreement-Short-term.docx](#)

Additional Information

Give any additional information here – eg. ‘applicants may be required to attend an interview’. *(Delete if not applicable)*

Submit as a word document - no more than one page long.