

NUS CHI-ChBE Joint Seminar



Artificial two-dimensional superlattices: synthesis and properties

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Abstract

Two-dimensional (2D) materials and their engineered lattices offer exciting opportunities for next-generation electronic, optoelectronic, and electrochemical devices. Yet, studies of high-quality heterostructures have been largely constrained to microscopic flakes. Here, we present scalable, controllable top-down methods that transform a wide range of van der Waals (vdW) single crystals into twisted moiré superlattices with high yield, exceptional uniformity, and macroscopic dimensions from millimetres to centimetres. Access to such large-area structures has enabled new discoveries, including ultrafast thermal exchange at bilayer interfaces, rapid photoinduced tuning of moiré patterns, and markedly reduced Debye temperatures in deformed monolayers compared to their isolated counterparts. Furthermore, by patterning 1D features—such as nanoribbon arrays and nanowrinkles — on 2D monolayers, we uncover unique electronic and thermodynamic behaviours absent in pristine layers. These advances in large-scale 2D artificial structures pave the way toward mass production and practical deployment of twistrionic devices.



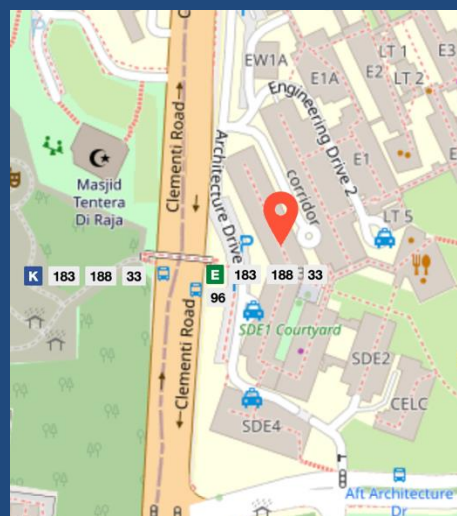
1 July 2026 (Wednesday)



11:00 am to 12:00 pm



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Biography

Liu Fang is an assistant professor of chemistry at Stanford University. She started her group in 2020. Her research is focused on the light induced dynamics of solid low dimensional materials and construction of low dimensional artificial structures. Prior to her current position, she was a postdoctoral fellow in the group of Prof. Zhu Xiaoyang at Columbia University. Prior to working in Columbia, she worked under the direction of Prof. Marsha I Lester at University of Pennsylvania. She received her Ph.D. in 2015 and worked as a postdoc in the same group in 2016. She received her B.S. in chemistry at Peking University in 2010.