



Department of  
Mechanical Engineering  
The University of Hong Kong

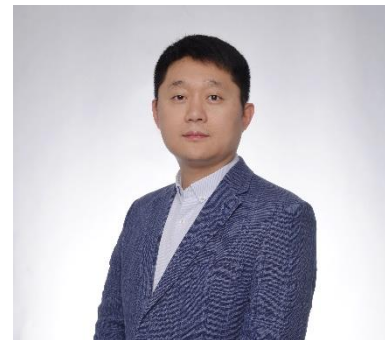


## SEMINAR

### **Biomimetic structural proteins: molecular engineering for high mechanical performance**

**Date:** 19 April, 2024 (Friday)  
**Time:** 2:45 p.m.  
**Venue:** CPD-3.23, Centennial Campus  
HKU

**Speaker:** Professor Kai Liu  
Department of Chemistry  
Tsinghua University  
China



#### **Abstract:**

Biomimetic structural proteins including engineered silk and adhesive proteins attract growing interests from academia due to their robust mechanical properties and promising high-tech applications majorly derived from hierarchically structured constituents. Through modularization of complex natural proteins, structural protein ensembles achieve enhanced functions which are far different from their individual entities, meanwhile reserving the easy-to-assemble and extraordinary mechanical behaviors. It also employs synthetic biology and chemical biology approaches to improve the adaptability between chassis cells, protein building blocks, and bulk assembled materials. Compared to de novo design and directed evolution, molecular engineering and modular assembly strategy avoids the complicated modeling and prediction of protein structures, enabling the acceleration of development and translation of new generation protein materials. In my talk, I will provide a guide giving insight into the molecular design, biosynthesis and assembly of biomimetic structural protein materials leveraging modular assembly strategy. I would like to show how modular assembly allows enhancement of biomaterial mechanical performance. I will also outline the bottlenecks and future perspectives, which could further guide the modular assembly strategy of novel structured proteins to enable large-scale production of biomimetic materials.

**Biography:**

Professor Kai Liu obtained his Ph.D. degree from the University of Groningen in The Netherlands. Following that, he conducted postdoctoral research at both the University of Groningen and Harvard University in the USA. In 2017, Dr. Liu assumed the position of a principal investigator at the Changchun Institute of Applied Chemistry of the Chinese Academy of Sciences in China. In 2020, he transitioned to the Department of Chemistry at Tsinghua University in Beijing. In the beginning of 2023, Dr. Liu was promoted to a tenured full professor and currently leads a laboratory engaged in research at the intersection of rare earth biotechnology, biosynthetic chemistry, and biomaterial engineering. He has published more than 170 papers in high-ranking journals, and 36 of his patents have been issued. Dr. Liu has received several awards over the years, including the National Science Fund for Distinguished Young Scholars, The Netherlands Organization for Scientific Research (NWO) Rubicon Award, Nano Research Young Innovator Award, Chinese Chemical Society's Chemical Biology Young Investigator Award, and China Rare Earth Science & Technology Award (first grade) and First Prize for Basic Research of Chinese Chemical Society Science and Technology Award. Besides, he is serving as peer-review editor or editorial board for several journals, including CAE flag journal Engineering and ACS Applied Bio Materials.

**ALL INTERESTED ARE WELCOME**

**For further information, please contact Prof. A. Shum at 3917 7904.**