



Department of Chemistry

香港城市大學  
City University of Hong Kong

## Special Departmental Seminar

*By*

**Dr. Caiwu LIANG**

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Department of Chemistry/Materials

Imperial College London, United Kingdom

# *Shining the light on electrochemical interfaces*

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**Date:** 28 April 2026 (Tuesday)

**Time:** 9:30 am – 10:15 am

**Venue:** G5-314 (Green Zone, 5th Floor)  
Yeung Kin Man Academic Building  
City University of Hong Kong

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*For abstract, please refer to the attached sheet.*

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~ All Are Welcome ~

## *Abstract*

Electrochemical interfaces underpin many technologies central to a sustainable energy future, including green hydrogen production, carbon dioxide conversion, and renewable chemical manufacturing. Yet these electrified interfaces remain difficult to understand because multiple reactive species form and evolve dynamically at the molecular level across a wide range of timescales. This limited understanding is a major barrier to the rational development of more active, selective, and durable energy materials.

In this talk, I will present my research on probing electrochemical interfaces using advanced time-resolved operando spectroscopies. I will first introduce an operando optical spectroscopy platform and analysis methods that enable the quantification of multiple redox states in transition metal oxide catalysts. I will then focus on water oxidation on iridium oxides, a reaction central to green hydrogen production, to show how time-resolved optical spectroscopy, synchrotron X-ray spectroscopy, and electrochemical mass spectrometry can identify reactive states, quantify their populations and energetics, and track their evolution in real time under catalytic conditions. I will discuss the active states responsible for water oxidation on state-of-the-art iridium oxide catalysts, how their population and energetics govern reaction kinetics, and how cations and interfacial water structure at the electrolyte–catalyst interface can tune reaction rates. Overall, this talk will show how advanced spectroscopy can uncover electrochemical interfaces at the molecular level and establish design principles for next-generation electrocatalysts.

## Biography



Dr. Caiwu Liang is a postdoctoral researcher in the departments of Materials and Chemistry at Imperial College London, and a visiting researcher at the University of Oxford, working with Prof. Ifan Stephens and Prof. James Durrant. He completed his PhD at Imperial College London in 2024, following an MSc from Tsinghua University in 2020 (Prof. Cheng Yang, Prof Feiyu Kang's group) and a BSc from Central South University in 2017.

His research focuses on understanding electrochemical interfaces in renewable energy systems at the molecular level using advanced operando spectroscopic techniques. He has developed operando optical spectroscopy platforms and multimodal time-resolved frameworks to identify the active species involved in electrocatalytic water oxidation. His work has been featured in *MIT Technology Review*, *Imperial News*, *Nature Materials* and *Nature Catalysis News & Views*.

In recognition of his contribution, Dr. Liang has received the Kirkbright–Steers Award from the Association of British Spectroscopists Trust, the Zero Pollution Pioneer Award from Imperial College London, and the John Kilner Prize for Energy Materials for his PhD thesis. He was also named an Outstanding Graduate during his master's studies at Tsinghua University. He has worked closely with industrial partners, including bp and Johnson Matthey, and has been invited to present his research at international institutions including the California Institute of Technology, the University of Oxford, the Helmholtz Institute Erlangen-Nürnberg, the Johnson Matthey Catalyst R&D Centre and UCSTC.