I²CNER Seminar Series

International Institute for Carbon-Neutral Energy Research (WPI-I²CNER)
Kyushu University

supported by
Research Committee on Phase Change and Interface,Thermal Engineering Division, JSME

**Title** **Development and application of spatiotemporally-resolved multiphysics measurement methods to phase-change and reacting flows**

**Speaker** ***Professor Christos Markides***
Clean Energy Processes (CEP) Laboratory, Imperial College London, U.K.

**Time & Date** 2:30 PM (JST), Friday, February 6th, 2026

**Venue** Hybrid format (#217, Conference Room A, I²CNER Bldg. 1, Ito Campus, Zoom)

## Abstract

Multiphase flows in the presence of heating, cooling, and in particular phase change and reactive phenomena, are encountered in many industrial systems, including in heat exchangers, condensers, evaporators, absorbers and reactors, amongst other, as well as in biological systems and the natural environment across a wide range of scales. Despite numerous experimental studies, the availability of detailed, spatiotemporally-resolved simultaneous information on the multiple underlying physical processes in these flows remains limited due to the challenges in performing relevant measurements.

Two-phase flows, specifically, present the experimentalist with a unique set of challenges, such as restricted (often sub-mm) fluid domains with moving and complex interfaces, across which phases have large refractive index changes leading to optical distortions. Experimental techniques based on optical measurement principles can be applied for the detailed interrogation of relevant flows, but further development is necessary for reliable data to be obtained. Once developed, these techniques can provide information with high spatiotemporal resolution on important scalar (e.g., temperature, concentration, phase) and vector (e.g., velocity) fields, as well as on interfacial characteristics and dynamics.

In this talk, we will present and discuss recent efforts to develop and apply a range of infrared, laser-based and other optical diagnostic techniques to multiphase flows with phase change and reaction, with the aim of providing important information with high spatiotemporal resolution in a selection of relevant flows. We will cover the deployment of simultaneous techniques for the generation of multiphysics and multiscale information, and discuss the specific challenges faced when attempting to perform such measurements. This information is enabling an increasingly complete fundamental understanding of related phenomena, and the improved design of relevant devices, technologies and systems.

## About the Speaker

Professor Christos Markides obtained an MEng degree in Engineering with distinction, followed by a PhD in Energy Technologies from the University of Cambridge. He now acts as Head of the Clean Energy Processes (CEP) Laboratory and Leader of the Experimental Multiphase Flow Laboratory, which is the largest experimental space of its kind at Imperial College London. He is also, amongst other, Editor-in-Chief of journals *Applied Thermal Engineering* and *AI Thermal Fluids*. He specialises in applied thermodynamics, fluid flow and heat/mass transfer processes in high-performance devices, technologies and systems, with a specific interest in advanced diagnostic techniques for the provision of detailed, spatiotemporally resolved information in turbulent, reacting and multiphase flows. He has authored >440 journal and >300 conference articles on topics related to this talk (h-index = 78; >20,800 citations). He has won multiple awards, including IMechE's 'Donald J. Groen' outstanding paper prize in 2016, IChemE's 'Global Award for Best Research Project' in 2018, IChemE's 'Clean Energy Medal' in 2025, and received Imperial College's President Award for Research Excellence in 2017. He has an interest in technology transfer, innovation and commercialisation, most recently as a founding Director of spin-out Solar Flow.

**Registration** https://forms.office.com/r/fLSWP1ytun

**Host** Prof. Shoji Mori

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