THE UNIVERSITY OF HONG KONG

DEPARTMENT OF MECHANICAL ENGINEERING

SEMINAR

Online

Title: **Bubble bursting with a compound interface: from submicron dispersals to multi-phase jetting**

Speaker: **Dr. Jie Feng**
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Mechanical Science and Engineering
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USA

Date: **20 January, 2022 (Thursday)**

Time: **10:00 a.m. (Hong Kong Time)**

Zoom meeting:

1) **Link to join the meeting:**
https://hku.zoom.us/j/97353578331?pwd=aUMvUmxBVzdTSWxxejc1VUdBWXNUQT09

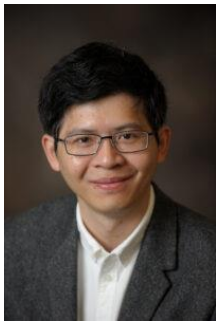
2) **Meeting ID: 97353578331**

3) **Password: 690724**

Abstract:
Bursting of bubbles at a liquid surface is ubiquitous in a wide range of physical, biological, and geological phenomena, as a key source of aerosol droplets for mass transport across the interface. However, how a structurally complex interface, widely present in nature, mediates the bursting process remains largely unknown. In this talk, we will describe our studies on bubble bursting dynamics with an oil-covered aqueous surface, which typifies the sea surface microlayer as well as an oil spill on the ocean. First, we will show that bubbles bursting at an air/oil/water-with-surfactant interface can disperse submicron oil droplets in water. Dispersal results from the detachment of an oil spray from the bottom of the bubble towards water during bubble collapse.

Surprisingly, the droplet size is selected by physicochemical interactions between oil molecules and the surfactants rather than by hydrodynamics. The implications of the dispersal mechanism for oil-spill remediation will also be demonstrated. Our system may provide an energy-efficient route, with potential upscalability, for applications in drug delivery, food production and materials science. Secondly, we will focus on the bubble-bursting jet dynamics at such a compound interface. The jet tip radius and velocity are altered with even a thin oil layer, and oily aerosol droplets are produced. We show that the coupling of oil spreading and cavity collapse dynamics results in a multi-phase jet and the follow-up droplet size change. The oil spreading influences the effective viscous damping of the capillary waves, and scaling laws are proposed to quantify the jetting dynamics. Our study not only advances the fundamental understanding of bubble bursting dynamics, but also may shed light on the airborne transmission of organic matters in nature related to aerosol production.

Short Biography:
Jie Feng is an Assistant Professor in the Department of Mechanical Science & Engineering at the University of Illinois at Urbana-Champaign directing the Fluids, Interfaces & Transport (FIT) laboratory. He obtained his Ph.D. in Mechanical & Aerospace Engineering from Princeton University, and did his postdoctoral research in Chemical & Biological Engineering at Princeton University before joining the University of Illinois in 2019. The research interests of his group lie in understanding micro-scale transport phenomena in structurally complex fluids and interfaces, to derive new insights in physico-chemical mechanisms and continuum-scale mechanics of multi-phase soft matter systems, as well as for their applications to solve challenging problems in environment remediation and human health. Currently, the research thrusts in his group include bubble dynamics with a structurally complex interface, polymer and lipid self-assembly for structured nanoclusters, and nanoparticle-oriented engineering for diagnostic delivery and controlled release. His research is supported by the Research Support Awards program from Illinois Campus Research Board and the American Chemical Society's Petroleum Research Fund.



ALL INTERESTED ARE WELCOME
For further information, please contact Prof. A.H.C. Shum at ashum@hku.hk

Research area: Fluid Mechanics