

Toward Lab-in-a-drop: Acoustic manipulation of droplets in air

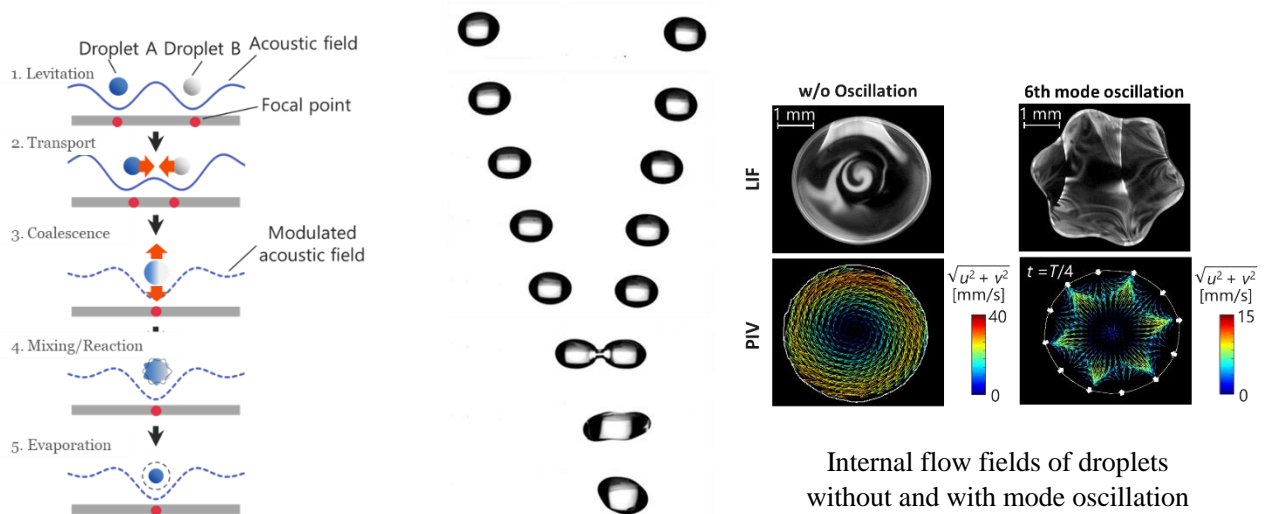
Koji Hasegawa

Department of Mechanical Engineering, Kogakuin University, Tokyo 163-8677, Japan
 kojihasegawa@cc.kogakuin.ac.jp



Abstract

The manipulation of droplets in air by acoustic fields has attracted great attention in various fields, including analytical chemistry, biology, medicine, and materials science. To realize this contactless droplet manipulation, a deeper understanding of the interfacial dynamics of droplets levitated in an acoustic field, along with the flow and heat/mass transport phenomena within and surrounding these droplets, is essential. While the development of measurement methods and the establishment of analytical techniques are crucial for illuminating these phenomena, the complexity of the dynamics (non-stationarity, non-linearity, and non-equilibrium) within acoustically levitated droplets needs to be comprehensively explored. This seminar will outline the proof-of-concept process for "lab-in-a-drop" using contactless droplet manipulation driven by an acoustic field. This approach represents a significant step towards a comprehensive understanding of these phenomena and the ongoing challenge of elucidating the underlying physics. The following topics will be covered: the principle of acoustic levitation, levitation stability (atomization), droplet group levitation, droplet transport and coalescence, mixing dynamics with novel visualization, evaporation of pure, binary, and ternary droplets.



Internal flow fields of droplets without and with mode oscillation

Contactless droplet manipulation by sound Coalescence of droplets in air