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Complex & Beautiful Physics of Phase-Change at Scale

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Abstract

Phase-change flows are already pretty complex and more so when these happen at scale. In this talk, I will focus on two types of phase-change: evaporation of droplets and bubble dynamics during boiling with added industrial complexities. These complexities include large populations, contamination with alcohol or anything more volatile and substrate wettabilities. These can have profound consequences on phase-change. In an attempt to partly unravel these, my talk will have three parts: Firstly, I will focus on phase-change of binary mixtures using three-pronged approach (theory, experiment, and direct numerical simulations) to reveal the physics when this happens at scale. Secondly, I will use boiling as example to show how very large scale direct numerical simulations help understand the role of wettability on heat-transfer coefficients. Thirdly, I will also show how particles in phase-change systems can cause chaos and remixing!