PHYSICAL MATH SEMINAR

When Evaporation Reverses Wicking: Predictive Scaling for Drop Spreading and Drying on Fabrics

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ABSTRACT:

Predictive modeling benefits from simple, physically based approaches that trade some fidelity for clarity and generality. In this talk, I illustrate that philosophy with experiments and a compact model for drop deposition, absorption, and evaporation on thin porous substrates (e.g., fabrics). We show that evaporation can reverse the wicking front so wetted patches shrink after reaching a maximum diameter, and that both this maximum diameter and the total evaporation time collapse onto a single dimensionless parameter built from substrate and liquid properties. Combining measurements and theory, we uncover a robust dynamic in which volatile drops spread for roughly one-quarter of their lifetime and then recede for the remainder. Throughout, I emphasize how minimal models, tightly constrained by targeted experiments, can yield predictive understanding across a wide range of practical problems in interfacial fluid dynamics.

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2:30 PM – 3:30 PM

MIT Building 2, room 449