



CNR-IAC
Istituto
per le Applicazioni
del Calcolo

Seminari Generali IAC 2024

AVVISO DI SEMINARIO

Luogo Area di Ricerca Napoli1
Via Pietro Castellino, 111, Napoli
Aula Conferenze Vaccaro

Data e ora Martedì 19 novembre 2024 ore 14.30

Speaker Francesca Pelusi

Titolo Thermal Convection in Emulsions:
Heat Transfer Properties and Role of Droplets

Abstract

This study explores the dynamics of emulsions—liquid droplets dispersed within another liquid—under buoyancy-driven thermal convection using lattice Boltzmann numerical simulations. We focus on the heat transfer properties of emulsions with varying droplet concentrations, examining cases from dilute to highly concentrated yield-stress emulsions exhibiting a complex non-Newtonian rheology. We investigate how the combination of complex rheology and the presence of finite-sized droplets influences the statistically steady convective state of emulsions under thermal convection. Specifically, at low buoyancy forces, just above the conduction-to-convection transition, we observe that heat transfer fluctuations increase with droplet concentration, due to the presence of finite-sized droplets. However, if the emulsion exhibits a yield-stress non-Newtonian behavior, the transition to convection requires an initial intermittent transient dynamics, during which rapid bursts of heat transfer are spaced out by long-lasting conductive periods, ultimately leading to phase inversion. To complete the above scenario, we then increase the buoyancy force and observe that it can trigger significant structural changes: droplets may undergo breakup, coalescence, and even phase inversion, resulting in a drastic variation in the emulsion rheology. Our findings link macroscopic heat transfer properties to droplet-scale dynamics, providing new insights into complex fluid behavior with broad applications in materials science, pharmaceuticals, and beyond.

Streaming <https://www.youtube.com/watch?v=3jAHCVIDcQU>

Link <https://www.iac.cnr.it/seminari-general-iac-2024>

Comitato organizzatore Nicola Apollonio, Roberta Bianchini, Claudia Capone, Giuliana Ramella



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