Seminário de Mecânica

Capture of fine particles by expanding drops in linear flows

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Plataforma Microsoft Teams - https://tinyurl.com/y25pv9rd

Abstract.

The present work investigates the two-particle dynamics of a solid particle and a semi-permeable spherical drop that expands due to osmosis in an external, pure-extensional flow field. Computational results from numerical integration of trajectories determine a transient collision efficiency, which describes the influence of hydrodynamic interactions and osmotic flow on particle capture. The results show that drop expansion, which decays slowly with time, greatly increases particle capture rates. Moreover, as the engulfment parameter increases, there is a transition from flow-dominated capture to expansion-dominated capture. For the case of a non-expanding droplet, we provide a numerical solution for the transient pair distribution function, which enables us to explain the transient particle capture rate in terms of the microstructure of the suspension. Furthermore, we derive an analytical expression for the initial collision efficiency at zero times, which agrees with our numerical data. The numerical results for non-expanding droplets at long times show increasing collision efficiency as the permeability increases and when the size ratio is near unity, in agreement with previous steady-state calculations. Weak diffusion effects inside of the droplet are also discussed.