

Abstract Submitted
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Three-dimensional Numerical Simulations of Annular Falling Film Wave Dynamics in the Presence of Soluble Surfactants¹ ASSEN BATCHVAROV, LYES KAHOUADJI, CRISTIAN CONSTANTE-AMORES, RICHARD CRASTER, OMAR MATAR, Imperial College London — Falling film reactors are a key unit operation for the production of surfactants. This work focuses on numerical investigations into the effect of soluble and insoluble surfactants on the wave dynamics of annular falling films. We carry out three-dimensional direct numerical simulations of the film dynamics using a hybrid front-tracking/level-set solver, where surfactant effects are modelled using a couple of convective-diffusion transport equations for the interfacial and bulk species (Shin *et al.*, *J. Comp. Phys.*, 359, 409-435, 2018). The influence of surfactant diffusivity, elasticity, and solubility on the wave dynamics, characterised by the shape of the emergent coherent structures, and their speed, is investigated as part of this work.

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