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**Emulsion droplet interactions: a front-tracking treatment**[1] LACHLAN MASON, Imperial College London, DAMIR JURIC, JALEL CHERGUI, LIMSI, CNRS, SEUNGWON SHIN, Hongik University, Korea, RICHARD V. CRASTER, OMAR K. MATAR, Imperial College London — Emulsion coalescence influences a multitude of industrial applications including solvent extraction, oil recovery and the manufacture of fast-moving consumer goods. Droplet interaction models are vital for the design and scale-up of processing systems, however predictive modelling at the droplet-scale remains a research challenge. This study simulates industrially relevant moderate-inertia collisions for which a high degree of droplet deformation occurs. A hybrid front-tracking/level-set approach is used to automatically account for interface merging without the need for 'bookkeeping' of interface connectivity. The model is implemented in Code BLUE using a parallel multigrid solver, allowing both film and droplet-scale dynamics to be resolved efficiently. Droplet interaction simulations are validated using experimental sequences from the literature in the presence and absence of background turbulence. The framework is readily extensible for modelling the influence of surfactants and non-Newtonian fluids on droplet interaction processes.

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