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A 2D Lattice Boltzmann Model for Hydrodynamics of Emulsions laden with Ellipsoidal particles SUBHABRATA DAS, Langmuir Center of Colloids and Interfaces, Columbia University, KEVIN CONNINGTON, Mechanical Engineering, Stevens Institute of Technology — We study the dynamics of randomly placed two-dimensional elliptical particles at droplet interfaces in a gravity-driven draining emulsion system consisting of a Newtonian fluid using 2D Lattice Boltzmann Model with long-range repulsive and frustrated short range attractive interactions. Both fluid-particle and particle-particle interactions along with the orientation of the particles need to be accounted for because the mutual competition between these phenomena coupled with tumbling effect govern the key features of elliptical particle-laden flows. As the denser liquid phase drains out, the dense to sparse emulsion transition is observed with droplet deformation, coalescence and eventual collapse with the emulsion start breaking at the top of the cell. However, this transition and droplet coalescence process is drastically reduced in presence of ellipsoids of varied hydrophobicity leading to formation of particle layers arresting coalescence with reduction of tumbling effects in the arrested state. The effects are changed when the affinity of the particles to each of the phases and the aspect ratio of the particles are varied.

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