

Particle dynamics in bidisperse suspension coating and drying systems

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Complex liquids used in coating industries are often polydispersed particulate suspensions to make the target-orientated coating products. Evenly distributed particles in the coating films or substrates are mostly desirable. However, such situation cannot be always achievable even though well-dispersed raw materials are supplied. In coating processes, for instance, the inhomogeneity in particle distribution can be encountered inside the slit channel at high shear rate flow regime and in drying operation at relatively high Peclet number. We have numerically studied the migration and segregation phenomena of bimodal spherical particles suspended in a Newtonian simple shear flow, employing the mesoscale lattice Boltzmann method (LBM). Also, transient development of concentration of bimodal colloids during vertical drying, whether small-on-top or large-on-top depending on drying conditions, has been elucidated using the LBM with the hydrodynamic interaction.