

Drying features of colloidal dispersion using lattice-Boltzmann simulation and continuum model

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Drying of colloidal suspension system is important in many industrial processes, including catalytic filters, electrodes for lithium ion battery, paint drying, and mineral processing. In this study, the transitional development of concentration gradient of colloids in the vertical direction has been mainly focused, clearly illustrating the change of microstructure during film formation. Due to the technical difficulties in experimental in-situ observation, one-dimensional continuum model and mesoscale simulation for drying dynamics of wet colloidal film were developed in this study, employing a fluctuating lattice Boltzmann method (LBM) which considers both thermal fluctuation and hydrodynamic interactions. The comparison with those of previous theoretical models demonstrates that LBM results with hydrodynamic interaction describe the reasonable drying dynamics of colloidal suspensions.