Abstract

The deposition morphology of particles onto the wall surfaces of a constricted tube is investigated by applying the Brownian dynamics simulation method in the present paper. The effect of various types of the total interaction energy curves of DLVO theory, and of the shadow area cast by those deposited particles, on the particles' collection efficiencies are examined. Applying with the concept of the control window where the approaching particles originate singularly and randomly, the present simulation method successfully describes the amount of particles collected as well as the morphology of the deposits in a detailed step-by-step manner by tracking the trajectories of individual particles as they move toward the tube wall. The simulation results show that the collection efficiency is always higher when the particle's Brownian motion behavior is not taken into consideration. As the deposition location moves closer to the middle region of the constricted tube, the dendrites formed by those non-Brownian particles contain more particles and get easier to plug the throat of the tube than those Brownain particles. The simulation results also fit well with the available experimental data.