EFFECT OF SALT CONCENTRATION AND FLOW RATE ON CLOGGING DYNAMCIS IN THE SINGLE MICRO-PORE

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ABSTRACT

Clogging is ubiquitous in a wide range of material processing. This undesirable phenomenon causes various flow problems. As a fundamental study of clogging, we investigate the clogging dynamics in terms of the colloidal interaction and hydrodynamics stress in a single-micro pore through microfluidics and image analysis.

Polystyrene suspension with various salt concentrations is used as a feed solution. Microfluidic observation is employed to investigate particle deposition in a contraction microchannel. To quantify particle deposition, particle deposition area is calculated and the pressure drop is also measured.

Dramatic differences in particle deposition were observed. When the colloidal interaction is repulsive, the deposition occurs mostly in the downstream. On the other hand, an opposite deposition behavior is identified when the colloidal interaction is attractive. As the flow rate is changed, more complex deposition behaviors are observed. The difference in particle deposition behavior was explained by the particle flux density and the ratio of the lift force to colloidal force.