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Electrokinetic Particle Aggregation and Flow Instabilities in Non-Dilute Colloidal Suspensions GURU NAVANEETHAM, JONATHAN POSNER, Mechanical Engineering Arizona State University — An experimental investigation of electrokinetic particle aggregation and flow instabilities of non-dilute colloidal suspensions in microfabricated channels is presented. The addition of charged colloidal particles can alter the solution's conductivity, permittivity as well as the average particle electrophoretic mobility. In this work, a colloid volume fraction gradient is achieved at the intersection of a Y-shaped PDMS microchannel. The solution conductivity and the particle mobility as a function of the particle (500 nm polystyrene) volume fraction are presented. The critical conditions required for particle aggregation and flow instability are given along with a scaling analysis which shows that the flow becomes unstable at a critical electric Rayleigh number for a wide range of applied electric fields and colloid volume fractions. Electrokinetic particle aggregation and instabilities of non-dilute colloidal suspensions may be important for applications such as the electrophoretic deposition of particles to form micropatterned colloidal assemblies, electrorheological devices, and on-chip, electrokinetic manipulation of colloids.

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