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Determining time scales for directed assembly of particles by shear flow and electric field[1] MINAMI YODA, ANDREW YEE, Georgia Institute of Technology, HAJIME ONUKI, YOSHIYUKI TAGAWA, Tokyo University of Agriculture and Technology — Suspended colloidal polystyrene particles assemble into structures called "bands" when subject to shear flow and a dc electric field. These bands exist only within a few μm of the wall, and have been observed over a wide range of conditions in combined Poiseuille and electroosmotic "counterflow" through microchannels, even at particle volume fractions as low as 33 ppm. There appear to be three stages in this process: 1) Accumulation, where particles are concentrated near the channel wall; 2) Band formation, with a relatively large number of unstable bands; and 3) Stable bands. The time scales for these stages were determined from evanescent-wave visualization images acquired at different streamwise channel locations. The standard deviation in the image grayscales was used to estimate the time required to reach the band formation stage, and compared with a similar time scale based instead on the time when the first band is observed. The mean grayscale, which was used instead to estimate the time to reach the stable bands stage, appears to have an exponential growth during the accumulation stage, and reaches its maximum value during the band formation stage, before decreasing to a relatively constant value in the stable bands stage.

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