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Shear-induced migration of dilute Brownian suspensions JINHUA CAO, STEVE WERELEY, Purdue University — A rigid spherical particle translating at small tube Reynolds number in a shearing flow experiences lateral migration due to inertial and wall effects, even in the limit of vanishingly small Reynolds numbers. In a suspension flow of sufficiently small particles, Brownian motion competes with this migration phenomenon. We investigate the migration phenomenon of Brownian particles in a pressure-driven flow for a range of particle volume fractions much less than 0.01 using epi-fluorescent microscopy and micro particle image velocimetry. The flow velocity and particle size are both varied, resulting in the bulk Peclét number (Pe) ranging over four orders of magnitude. Both the velocity and the particle distributions were measured. When Pe is smaller than 1000, particles migrate away from the channel wall due to the wall effect while the particle concentration in regions remote from the wall (more than 10 particle diameters) remains nearly uniform. When Pe increases beyond 1000, all particles, whether initially near the wall or near the center of the channel, move toward a preferred radial position of 0.5 to 0.7 times the channel radius, with the migration effect becoming progressively stronger as Pe increases.

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