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Force induced microdiffusivity of colloidal particles ROSEANNA ZIA, JOHN BRADY, California Institute of Technology — In constant force microrheology the velocity of the probe particle fluctuates owing to interactions with the surrounding medium. On long time scales, this fluctuating velocity gives rise to a diffusive motion of the probe particle. We study this diffusive motion as the Peclet number, Pe – the ratio of the strength of the external driving force, $\boldsymbol{F}^{ext}$, compared to thermal forces, kT/a – is varied. Here, kT is the thermal energy and a the probe size. At small Pe, Brownian motion dominates and the diffusive behavior characteristic of passive microrheology is recovered. At the other extreme of high Peclet numbers the motion is still diffusive, and the diffusivity becomes "force-induced" scaling as $\boldsymbol{F}^{ext}/\eta$, where η is the viscosity of the solvent. Specific calculations are performed for a probe particle of size a immersed in a background of colloidal bath particles of size b. The diffusive motion becomes increasingly anisotropic as the Peclet number is increased – motion parallel to the direction of forcing exceeding that transverse. The "force-induced" microdiffusivity is compared with the analogous "shear-induced" diffusivity found in macrorheological measurements.

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