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Inertial effects in viscoelastic materials and their implication in passive microrheology[1] TSUTOMU INDEI, JAY SCHIEBER, ANDRÉS CÓRDOBA, Illinois Institute of Technology, IIT COLLABORATION — We review our recent series of works about inertial effects of soft viscoelastic materials on the particle diffusion in the materials, and their ramifications for one- and two-bead passive microrheology. Firstly we focus on the effects of particle inertia, especially on the oscillation of the particle's mean-square displacement (MSD). This is the resonance oscillation between the inertial motion of the particle and the elastic components of the viscoelastic materials. Secondly we discuss the material inertia, focusing on the so-called Basset force of the viscoelastic bodies. The kinetic energy of the particle is dissipated not only due to the Stokes drag but also through the Basset force as the radiational propagation of the shear wave excited by the particle motion. The resonance oscillation of the MSD tends to decrease due to the Basset force. The Basset force is characterized by the wave length Λ and the penetration depth Δ of the shear wave. At high frequencies, the Basset force becomes important when Λ is less than the particle size (for single-bead microrheology) or less than the distance between two particles (for two-bead microrheology). On the other hand, at low frequencies, the Basset force is effective when Δ is larger than the sample size. Finally we show several examples of microrheological analysis taking account of these inertial effects.

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