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A finite Re slender body theory ANUBHAB ROY, Department of Applied Mechanics, Indian Institute of Technology Madras, Chennai 600036, India, DONALD L. KOCH, Smith School of Chemical and Biomolecular Engineering, Cornell University, Ithaca, NY 14853, USA — The effects of fluid inertia on the settling motion of fibers is studied theoretically. Khayat & Cox (1989) were the first to give a theory of hydrodynamic forces and torques on a slender body when fluid inertia is non-zero. Their theory uses a matched asymptotic expansion with a viscous inner flow and Oseens approximation for the outer flow. This restricts the analysis to cases where Re defined based on fiber diameter (Re_D) is zero. We develop a novel finite Re slender body theory that allows the inner flow to be described by steady Navier-Stokes and thus provide better comparisons of drag and torque with realistic scenarios where the $Re_D \neq 0$.

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