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Instability of settling non-spherical particle in a vertical shear flow DEWEI QI, Western Michigan University, DONALD KOCH, Cornell University, GANESH SUBRAMANIAN, JNCASR, Bangalore, India — Two mechanisms are attributed to the cross-stream migration when fiber settles in a vertical shear flow. First, a particle may migrate toward streamlines of the imposed shear flow with smaller downward fluid velocities, due to relative translation of the particle and fluid, called the Saffman effect. Second, a non-spherical particle at finite Reynolds number will attempt to rotate with its long body along the horizontal direction due to inertial torque. On the other hand, the torque due to the imposed weak vertical shear flow rotates the non-spherical in the opposite direction. The dynamic balance between the two torques may lead to a small angle between the particle long body and horizontal plane and may drive the particle migrate toward the streamlines of the shear flow with the large downward fluid velocity. The second mechanism was recently proposed by Shin, Koch and Subramanian.A fiber with aspect ratio $\kappa = 2$, 1.6, 1.2 1.1 and 0 is used to study the lateral migration. It is shown that at a given shear and aspect ratio, fiber lateral migration can be divided into three phases depending on the Reynolds number. The simulation results identified the lateral migration phase diagram and confirm the second mechanism.

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