Wall effects on viscous fluid spheroidal droplet in a micropolar fluid spheroidal cavity

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Abstract

The present study examines the steady, axisymmetric Stokes flow past a viscous fluid spheroid whose shape deviates slightly from that of a sphere in a micropolar fluid spheroidal cavity. Inertial effects are neglected for both the inner and outer fluids. The boundary value problem is solved analytically using the cell model technique. The boundary conditions used are the vanishing of the normal velocities, the continuity of the tangential velocities, the continuity of shear stresses and the spin-vorticity relation at the surface of the inner viscous fluid spheroid. On the outer spheroidal surface (filled with micropolar fluid), four known boundary conditions, namely Happel's, Kvashnin's, Kuwabara's and Cunningham's (Mehta-Morse) are considered. The dependence of the wall correction factor on the spin parameter, viscosity ratio, volume fraction, deformation parameter and the micropolarity parameter is studied numerically and its variation is presented graphically. Both types of spheroids, prolate and oblate are considered. As a limiting case, the drag force acting on micropolar fluid past a viscous fluid spheroid in an un-

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