Proceedings of the National Conference on Computational Modeling of Fluid Dynamics Problems (CMFDP-2019)
NIT Warangal, India – Jan 18-20, 2019
Paper No. XXX (The number assigned when the paper is accepted)

Cell Models for Non-Newtonian Fluid Past a Semipermeable Sphere

M. Krishna Prasad[a]
[a] *Department of Mathematics, National Institute of Technology, Raipur-492010, Chhattisgarh, India*

*Corresponding author Email: madaspra.maths@nitrr.ac.in , kpm973@gmail.com

Received: Date? Accepted: Date?

The steady axisymmetric creeping flow of an incompressible non-Newtonian fluid (micropolar fluid) past an assemblage of semipermeable sphere in cell models is studied. Stokes equations of micropolar fluid are employed inside the fluid envelope and Darcy's law is used inside the semipermeable region. Continuity of normal component of velocity, vanishing of tangential component of velocity, and continuity of pressure at the semipermeable fluid interface are used, while at the fluid interface of the envelope, the Happel, Kuwabara, Kvashnin, and Cunningham boundary conditions, are considered. No spin boundary condition is assumed at the semipermeable and cell surface. The corresponding expression for the drag acting on the semipermeable particle is derived and, hence, the wall correction factor is obtained. The special cases of the expression for drag on the semipermeable sphere in cell models filled with Newtonian fluid, the semipermeable sphere in the case of uniform flow in an unbounded medium, and the impermeable solid sphere in cell models are obtained.