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Motion of an approximate sphere in a Brinkman medium D. PALANIAPPAN, Department of Mathematics & Statistics, Texas A&M University, Corpus Christi, O. S. PAK, Department of Mechanical Engineering, Santa Clara University — The motion of an approximate sphere through a porous medium modeled using the Brinkman equation is investigated. Analytic solutions for the velocity and pressure fields due to the translation of a perturbed sphere in a Brinkman medium are found via the Stokes stream function approach. Explicit expression for the stream function is obtained to the first and second order in the small parameter characterizing the deformation. The cases of prolate and oblate spheroids, which depart only slightly from the spherical shape form, are considered as particular examples and the hydrodynamic force on these non-spherical bodies are evaluated. Beyond the first order of deformation, it is found that the hydrodynamic drag on a non-spherical body depends on the permeability coefficient in manners different from the case of a perfect sphere. These differences suggest the complex interactions between non-sphericity and permeability. Several special cases are deduced from our exact solutions. The results may be applied to investigate the effects of particle geometry in transport and locomotion in porous media.

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