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Oscillatory slip flow past a spherical inclusion embedded in a Brinkman medium D. PALANIAPPAN, Texas AM University, Corpus Christi — Non-steady flow past an impermeable sphere embedded in a porous medium is investigated based on Brinkman model with Navier slip conditions. Exact analytic solution for the stream-function - involving modified Bessel function of the second kind - describing the slow oscillatory flow around a rigid spherical inclusion is obtained in the limit of low-Reynolds-number. The key parameters such as the frequency of oscillation λ, the permeability constant δ, and the slip coefficient ξ control the flow fields and physical quantities in the entire flow domain. Local streamlines for fixed times demonstrate the variations in flow patterns. Closed form expressions for the tangential velocity profile, wall shear stress, and the force acting on the sphere are computed and compared with the existing results. It is noted that the slip parameter in the range $0 \leq \xi \leq 0.5$ has a significant effect in reducing the stress and force. The steady-state velocity overshoot behavior in the vicinity of the sphere is re-iterated. In the limit of large permeability, Darcy (potential) flow is recovered outside a boundary layer. The results are of some interest in predicting maximum wall stress and pressure drop associated with biological models in fibrous media.

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