Abstract Submitted
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Viscous flow in and around a cavity surrounded by a concentric permeable patch D. PALANIAPPAN[1], Department of Mathematics Statistics, Texas AM University, Corpus Christi — Steady viscous incompressible fluid flow in and around a spherical fluid cavity of radius a surrounded by a permeable patch with thickness $b-a$ is investigated in the limit of low-Reynolds number. Our model uses the Stokes equations in the pure fluid regions and the Darcy law in the concentric permeable patch. Analytic solutions for the velocity and pressure fields are derived in singularity form involving the key parameters such as the Darcy permeability coefficient k and the thickness of the permeable layer. The Faxen law for the hydrodynamical drag acting on the concentric spherical geometry due to an arbitrary incident flow is extracted from our singularity solutions. It is found that the thickness of the permeable layer and the permeability play a crucial role in controlling the drag. An expression for the mass of the fluid that enters the outer sphere is calculated by integrating the exterior radial velocity field. The hydrodynamic force on the concentric spherical shell due to the flow induced by a Stokeslet is also derived from our general expressions. Several special cases of interest are deduced from our exact analysis. The results are of some interest in the prediction of forces exerted on the walls in certain biological models with permeable layers.

[1]I request you to place my presentation on the 19th (Sunday) as I have to give final exams on Monday. Thank you

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