

Effect of Velocity Slip on Two Phase Flow in an Eccentric Annular Region

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Abstract : A mathematical model is developed to study the simultaneous effects of particle drag and slip parameter on the velocity as well as rate of flow in an annular cross sectional region bounded by two eccentric cylinders. In physiological flows this phenomena can be observed in an eccentric catheterized artery with inner cylinder wall is impermeable and outer cylinder wall is permeable. Blood is a heterogeneous fluid having liquid phase consisting of plasma in which a solid phase of suspended cells and proteins. Arterial wall gets damaged due to aging and lipid molecules get deposited between damaged tissue cells. Blood flow increases towards the damaged tissues in the artery. In this investigation blood is modeled as two phase fluid as one is a fluid phase and the other is particulate phase. The velocity of the fluid phase and rate of flow are obtained by transforming eccentric annulus to concentric annulus with the conformal mapping. The formulated governing equations are analytically solved for the velocity and rate of flow. The numerical investigations are carried out by varying eccentricity parameter, slip parameter and drag parameter. Enhancement of slip parameter signifies loss of fluid then the velocity and rate of flow will be decreased. As particulate drag parameter increases then the velocity as well as rate flow decreases. Eccentricity facilitates transport of more fluid then the velocity and rate of flow increases.

Keywords : catheter, slip parameter, drag parameter, eccentricity

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