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EFFECT OF VARIABLE VISCOSITY AND TWO PHASE FLOW ON SOLUTE TRANSFER IN PERMEABLE TUBES

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Abstract

The steady mass transfer in a fluid flowing through a rigid cylindrical tube with permeable wall has been considered. The flow induces a core of radius 'a' rich in red cells, surrounded by peripheral cell free plasma layer. The dynamic viscosity in the core depends upon the shear rate and hematocrit and obeys Quemeda's rheological law. The governing equations are coupled due to the boundary condition on velocity which obeys Starling's hypothesis. The coupled equations are solved numerically by assuming an initial approximate value for concentration. Fourth order Runge-Kutta method is used to solve ordinary differential equations for pressure, and a finite difference technique of Crank Nicholson type is used to solve parabolic partial differential equations. The results are plotted graphically. The effect of shear dependent viscosity is to decrease velocity significantly, increase ultrafiltration pressure and thereby decrease concentration polarization. A comparison with existing experimental results of Jaffrin et.al. is made for total solute clearance. The present study is in good agreement with experimental results.

Key Words : Quemeda viscosity, Double layered flow, Starling's hypothesis, Shear dependent viscosity, Concentration polarization, Solute clearance.