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EFFECT OF VARIABLE DIFFUSION COEFFICIENT ON SOLUTE TRANSFER IN CASSON FLUID FLOW THROUGH PERMEABLE TUBES

R. INDIRA, M. VENKATACHALAPPA AND T. R. RANGANATHA

Abstract

A mathematical model for convective and diffusive mass transfer within and across ultra filtering capillary is developed. The non-Newtonian characteristic of blood is considered by using Casson model and the variation of diffusion coefficient due to concentration is incorporated in the model. The diffusion coefficient is assumed to be an exponential function of concentration. A numerical scheme based on Crank - Nicholson type of finite difference scheme is considered to solve the

species transport equation. Approximate initial concentration is assumed in order to solve the coupled equations. The effect of yield stress is to increase concentration polarization and decrease total clearance where as variable permeability and concentration dependent diffusion coefficient decrease concentration polarization and increase total solute clearance. The ultra filtration parameter e is found to have very significant role in controlling solute transfer in and across the tube. This study provides the knowledge of physical parameters which have to be considered while manufacturing artificial kidneys.

Key Words : Casson fluid flow, Ultra filtration, yield stress, solute clearance, Starling's hypothesis.