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Effect of viscoelasticity and RBC migration phenomena in stenotic microvessels YIANNIS DIMAKOPOULOS, Laboratory of Fluid Mechanics and Rheology, Dep. of Chemical Engineering, University of Patras, ALEXANDROS SYRAKOS, GEORGIOS GEORGIOU, Department of Mathematics, University of Cyprus, JOHN TSAMOPOULOS, Laboratory of Fluid Mechanics and Rheology, Dep. of Chemical Engineering, University of Patras — This study deals with the numerical simulation of the hemodynamics in stenotic microvessels. The blood flow in microvessels differs significantly from that in large arteries and veins, because the Red Blood Cells (RBCs) are comparable in size with the radius of the microvessels and, consequently, local effects such as cell interaction and migration are more pronounced. In terms of complexity of the flow, viscoelasticity along with stress-gradient induced migration effects have a more dominant role, which exceeds the viscous, inertial and transient effects. Recently, a non-homogeneous viscoelastic model has been proposed by Moyers-Gonzalez et al. (2008), which can accurately predict the Fahraeus effects. We developed a numerical algorithm for the time-integration of the set of differential equations that arise from the coupling of momentum, mass, and population balances for RBCs and aggregates with the constitutive laws for both species. The simulations show that a cell-depleted layer develops along the vessel wall with an almost constant thickness. Along this layer, the shear stresses are almost Newtonian because of the plasma, but the normal stresses that are exerted on the wall are high due to the contribution of the individual RBCs and rouleaux.

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