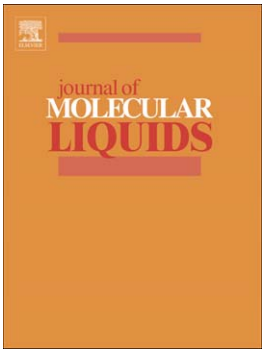

Heat and mass transfer of two-phase flow with Electric double layer effects induced due to peristaltic propulsion in the presence of transverse magnetic field

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Heat and mass transfer of two-phase flow with Electric double layer effects induced due to peristaltic propulsion in the presence of transverse magnetic field

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Abstract: Biologically-inspired propulsion systems are currently receiving significant interest in the engineering applications. Motivated by these developments, in the present article analysed heat and mass transfer with the transverse magnetic field on peristaltic motion of two-phase flow (particle-fluid suspension) through a planar channel have been examined. The flow is observed under the influence of electric field and chemical reaction. The present flow problem is modeled using lubrication theory approximation and also with a combination of long wavelength and creeping flow regime assumptions. Moreover, the problem is further simplified using Debye linearization. Analytical solutions are obtained for the resulting coupled ordinary differential equations. The influence of various emerging parameters is discussed for velocity, temperature and concentration profile. Furthermore, the behavior of pressure rise is also discussed to analyse the pumping characteristics. Trapping mechanism is also presented with the help of streamlines. It is observed that velocity distribution tends to increase significantly due to the greater effect of electric field and electro-osmotic parameter, however, magnetic field and particle volume fraction provides a marked resistance to the flow. The influence of electric field and electro-osmotic parameter depicts converse behavior on temperature and concentration distribution. Furthermore, chemical reaction parameter causes a significant reduction in the concentration distribution. The main motivation of the present study is due to such fact that two-phase flow process is very important to analyse the peristaltic muscular expansion and contraction in propagating various biological fluids that act like a particle-fluid mixture. The present study has a wide