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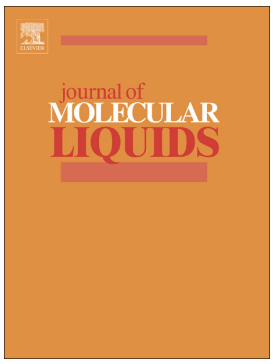

Thermal radiation effects on electroosmosis modulated peristaltic transport of ionic nanoliquids in biomicrofluidics channel

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Thermal radiation effects on electroosmosis modulated peristaltic transport of ionic nanoliquids in biomicrofluidics channel

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The flow characteristics of nanofluids flow driven by combined effects of electroosmosis and peristalsis are very important for designing bio-mimetic pumping systems at the micro scale of interest in physiological treatment e.g. occular drug delivery systems. The flow characteristics of thermally developed nanofluids flow are investigated in presence of peristalsis and electroosmosis phenomena. Thermal radiation effect is also introduced. Tapered asymmetric microchannels are imposed at the walls to mimic sophisticated peristaltic wave propagation scenarios. The nanofluid is employed as the working fluid, and the analytical solution for electro-osmotic flow is obtained by virtue of the Debye–Hückel linearization. The dimensional conservation equations are linearized under lubrication theory approximations. The effects of emerging physical parameters namely Grashof numbers, Brownian motion parameter, thermophoresis parameter, Helmholtz-Smoluchowski velocity, Debye length and thermal radiation on flow characteristics, heat transfer characteristics, and pumping characteristics are computed. Furthermore, an inherent phenomenon of peristaltic pumping known as trapping is also presented graphically under the influence of pertinent parameters and discussed in brief. Validation of present model is also presented. This model is mainly applicable to study cell responses, blood analysis, biomimetic capillary designs, and blood vessel tissue culture systems.

Keyword: *Peristalsis; Electric double layer; Axial electric field; Nanofluids; Tapered microchannel; Thermal radiation; Thermophoresis.*

1. Introductions

Bio-microfluidics is a new branch of biofluid mechanics where a small amount of biological fluids like blood, urine, stool etc., cells, particles, and biological components (eg. proteins and DNA) are manipulated/simulated/diagnosed using microchannel or capillary. Owning to the

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