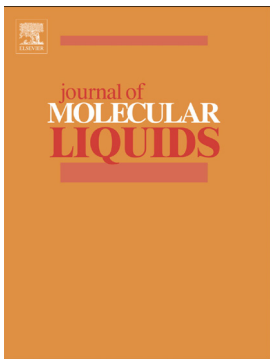

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Entropy generation in peristalsis with different shapes of nanomaterial

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Abstract: The purpose of present study is to analyze peristalsis in a vertical channel by using different shapes of nanomaterial. The nanomaterial utilized for this purpose is silver (Ag) with water as base fluid. The study is based on the comparison amongst different shapes of nanoparticles (bricks, cylinders and platelets). The walls of channel are of flexible nature. Study is done in the light of long wavelength and low Reynolds number approximations. Solution technique utilized here is perturbation with Grashof number as perturbation parameter. Entropy generation analysis is also carried out with different shapes of nanoparticles. The graphs of Bejan number, entropy generation, velocity and temperature are drawn for the sake of comparison for the considered nanoparticles. Streamlines are also studied. The results lead to the fact that an increase in nanomaterial volume fraction decays the velocity and temperature of the nanofluid. The Hall parameter and Hartman number show opposite behavior for velocity, temperature, entropy generation and Bejan number. Highest values of temperature, Bejan number and entropy generation have been seen for brick shaped particles and smallest for platelet shaped particles.

Keywords: Ag, water, slip boundary conditions, peristalsis, complaint walls, mixed convection, entropy generation and different shapes of nanoparticles.

Introduction

The convectional heat transfer rate of the common fluids like water, ethylene glycol, kerosene oil etc. are found inadequate in view of growing heat transfer requirements. Thus the scientists and researchers join hands to find some solution of this problem. They worked theoretically and carried out many experiments for rate of heat transfer enhancement. They proposed technique for enhancement in heat transfer by using micro-meter and milli-meter sized particles with high thermal conductivity in the convectional fluids having low thermal conductivity. Later on many drawbacks were found for this technique. Some of the prominent disadvantages were flow clogging and corrosion of the heat exchanging components, high pressure drop etc. To overcome the problem of clogging, they include the tiny (nanosized) particles in conventional low thermal conductivity fluids which was found to be very useful. The nanofluids has enhanced thermophysical properties when compared to other fluids. Nanofluids are the suspensions with particles of sized 1-100 nm and the base fluid. Choi [1] was the first whose conceived the idea of nanofluids to enhance the thermophysical properties. Now a days due to their special characteristics the nanofluids are utilized in heat exchangers, power production, refrigeration process, chemical industry, magnetic sealants, food industry, environment engineering,

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