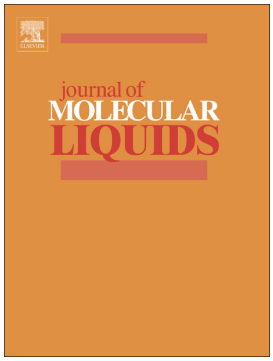

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Thermophoresis and Brownian motion effects on peristaltic nanofluid flow for drug delivery applications

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Abstract

In this study a simple and highly accurate semi-analytical method called the Differential Transformation Method (DTM), is used for solving the governing equations of peristaltic nanofluid flow in drug delivery systems. The effects of thermophoresis and Brownian motion parameters on temperature and velocity fields are discussed in details. The validity of the results of DTM solution are verified via comparison with numerical results obtained using fourth order Runge-Kutta method. The results show that by increasing the Brownian motion and thermophoresis parameters the temperature profile increases. Also, results reveal that DTM is very effective and convenient. Furthermore, it is found that this method can be easily extended to other strongly nonlinear heat transfer equations and can be found widely applicable in engineering and science.

Keywords: Nanoparticles, Thermophoresis, Brownian motion, Differential Transformation Method (DTM), Drug delivery.

1. Introduction

Peristalsis is one of major transport mechanism used for fluid transportation in physiology. This mechanism comprises of waves of area contraction and relaxation propagating along the channel walls. Applications of peristalsis in physiology can be seen in food transport through esophagus, chyme movement through intestine, urine transport from kidneys to the bladder, fluid mechanics in perivascular space of brain, sperm transport in male reproductive tract etc. Main benefit of peristalsis is that the fluid transported through this mechanism avoids contamination caused due to direct contact with external environment. This advantage convinced engineers to apply this mechanism in designing several industrial devices e.g. roller/finger pumps, hose pumps, heart–lung and dialysis machines and pumps used in transport of several corrosive and sensitive fluids

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