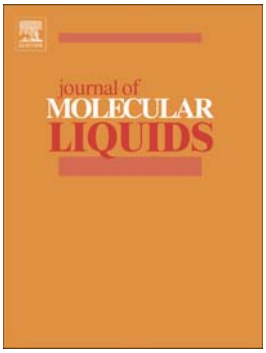

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Analytical and Numerical Investigation of Thermal Radiation effects on Flow of viscous Incompressible fluid with Stretchable Convergent/divergent Channels

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Abstract: This article, investigates the flow of a viscous incompressible fluid between two nonparallel plane walls, known as Jeffery-Hamel flow, under the influence of thermal radiation. The walls are capable of stretching and shrinking rectilinearly. With the help of suitable similarity variables, the dimensional partial differential equations, governing the flow, are transformed into a coupled system of ordinary differential equations. The Soret and Dufour effects are also taken into consideration while modeling the flow. The analytical solution of the flow model is then obtained by employing Adomian's decomposition method. The same problem has also been solved numerically with the help of fourth order Runge-Kutta scheme. A comparison between the analytical and numerical solutions has been presented and discussed. The influence of different non-dimensional parameters appearing in the flow model on the velocity, temperature and concentration profiles is discussed with the help of graphs. The rates of heat and mass transfer at the walls are also investigated.

Keywords: Jeffery-Hamel flow, Stretching/Shrinking channels, Adomian's decomposition method, Non-linear ordinary differential equations.

1 Introduction

The flow between two nonparallel walls (known as convergent/divergent channel), was first investigated by Jeffery (Jeffery, 1915) (in 1915) and Hamel (Hamel G, 1916) (in 1916). Therefore, these types of flows are often termed as Jeffery-Hamel flows in literature. It is the flow of viscous incompressible fluid between two nonparallel walls separated by an angle 2α and having a sink or source at the intersection of the walls. This type of flow has a great significance due to multifarious range of applications in