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Investigation of Sisko fluid through entropy generation

M. Ijaz Khan^a, S. Qayyum^a, T. Hayat^{a,b}, A. Alsaedi^b and M. I. Khan^{c,1}

^aDepartment of Mathematics, Quaid-I-Azam University 45320, Islamabad 44000, Pakistan

^bNAAM Research Group, Department of Mathematics, Faculty of Science, King Abdulaziz University, Jeddah 21589, Saudi Arabia

^cHeriot Watt University, Edinburgh Campus, Edinburgh EH14 4AS, United Kingdom

Abstract: In present paper boundary layer flow of Sisko fluid by stretching sheet is examined. Combined effects of nonlinear thermal radiation, heat generation/absorption, Joule heating are discussed. Main purpose is to analyze the entropy generation in Sisko fluid flow. By using suitable similarity variables modeled boundary layer PDE's are transfigured into ODE's. The obtained system of equations are solved by using analytical technique (HAM). Graphs are developed to show the effects of pertinent parameters on velocity, temperature, entropy generation, Bejan number, skin friction and Nusselt number. Velocity for larger material parameter reduces. Temperature is more for greater Biot number and radiation parameter. Bejan number is maximum away from the sheet for shear thickening fluids and approaches to zero for shear thinning fluids.

Keywords: Sisko fluid model; Entropy generation; Nonlinear thermal radiation; Joule heating and Viscous dissipation; Heat generation/absorption; Convective boundary conditions.

1 Introduction

The complex rheology of biological fluids has inspired investigations including numerous non-Newtonian liquids. Recently, due to involvement in mechanical and industrial applications non-Newtonian liquids gain much importance. More certainly these fluids are used in the synthetic and automatic processes, oil store building foods stuffs, material handling, businesses and many others. Stress tensor in such material is associated to the shear rate by non-linear link. Materials like drilling mud, shampoos, fruit puree, ketchup, clay coating and many suspensions, specific greases and oils, blood, polymer melts, paints and certain oils, elastomers and many emulsions and some other thin and thick oils have been treated as non-Newtonian fluids. Non-Newtonian liquids have different properties and attributes so

¹Corresponding author:

Email address: mk42@hw.ac.uk

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