

**CHEMICALLY-REACTING MIXED CONVECTIVE HEAT AND MASS
TRANSFER ALONG INCLINED AND VERTICAL PLATES WITH
SORET AND DUFOUR EFFECTS: NUMERICAL SOLUTIONS**

O. A. Bég¹, T. A. Bég², A. Y. Bakier³, and V. R. Prasad⁴

¹*Engineering Magneto-hydrodynamics and Heat Transfer Research, Mechanical Engineering Program, Room 4112, Sheaf Building, Faculty of Arts, Computing, Engineering and Sciences, Sheffield Hallam University, Sheffield, South Yorkshire, S1 1WB, UK.*

Email: docoanwarbeg@hotmail.co.uk

²*Engineering Mechanics Research, 18 Milton Grove, Manchester, M16 0BP, England, UK.*

³*Department of Mathematics, Assiut University, Assiut, Egypt.*

⁴*Department of Mathematics, Madanapalle Institute of Technology and Science, Madanapalle-517325, India.*

Received 24 June 2008; accepted 8 December 2009

ABSTRACT

The heat and mass transfer characteristics of natural convection flow of a chemically-reacting Newtonian fluid along vertical and inclined plates in the presence of diffusion-thermo (Dufour) and thermal-diffusion (Soret) effects are studied. The conservation equations for mass, momentum, heat and concentration are normalized and then solved using the local nonsimilarity method and a shooting scheme. Velocity is increased with order of the chemical reaction (m) as is temperature (θ) and concentration (ϕ). Temperature (θ) is increased with increasing positive inclination of the plate (γ), whereas velocity (f') is reduced. An increase in reaction rate parameter (γ) however reduces the concentration values in the boundary layer. Skin friction coefficient is found to be enhanced with a positive increase in concentration-to-thermal-buoyancy ratio parameter (N) as are local Nusselt number and the local Sherwood number. A negative N value reverses this trend. An increase in Dufour number, Du (with a simultaneous decrease in Soret number), (Sr) significantly heats the fluid and also increases concentration values. For the non-reactive case, neglecting Dufour and Soret effects, good correlation of the present numerical solutions is achieved with the earlier study by Chen et al (1980). The present study finds applications in chemical engineering, furnaces, solar collector energy systems and geophysical fluid mechanics.

Keywords: Chemical reaction, heat and mass transfer, inclined plate, Soret and Dufour effects, numerical analysis.

1 INTRODUCTION

Chemically-reacting boundary layer flows have received considerable attention in the engineering sciences owing to extensive applications in combustion processes (Cheng and Kovitz 1958), hypersonic aerodynamics (Inger 1966), rocket nozzle heat transfer (Daily et al

Int. J. of Appl. Math and Mech. 5(2): 39-57, 2009.

Click here to access this Book :

FREE DOWNLOAD

Convective Heat And Mass Transfer Solutions

[Convective Heat And Mass Transfer](#)

Thank you for downloading [Convective Heat And Mass Transfer Solutions](#). As you may know, people have search many times for their choices novels like this Convective Heat And Mass Transfer Solutions, but end up in harmful.

Rather than read a good book with a cup of coffee in the afternoon, instead, they are with a virus virus harmful} in their laptop.

Convective Heat And Mass Transfer Solutions is available in our digital library which online access is set to public so you can get it instantly.

Our book collection hosts in multiple countries, giving you the shortest latency time to download any of our books like this one.

Please say, the Convective Heat And Mass Transfer Solutions is universally compatible with all reading devices

[In English Transformational Grammar](#), [New York Ccls 8 Ela Answers](#), [For Heavy Commercial Construction Answers](#), [Readings Exercises Cases 6th Sixth, 326 F2004 Rop](#), [Field Writing Readings Handbook](#), [Strategies D Reading](#), [Love Again Knight Annalyse](#), [Chinese Novel Rolston David Princeton](#), [Readers Level 4 Murder On The Orient Express](#), [Dread Childhood Braunstein Nestor](#), [And Writing Workout For The Sat](#)

[2nd Edition 245 Practice Questions With Complete Answer Explanations College Test Preparation](#), [Connections Skills And Strategies For Purposeful High Intermediate Student Book](#), [Finance By Bp Tyagi Free About Finance By Bp Tyagi Or Read Online Viewer](#), [Skills For Success Reading And Writing 2 Class](#), [World U](#), [Papers For Teachers](#), [Test With Answer Key](#), [New York Ccls 8 Answer Key](#), [Comprehension With Answers And Questions](#), [Rediscovering American Bestsellers Charlotte Temple](#), [IA Reading Skills Book](#), [1 Reading Wegmann Brenda](#), [Geography A Reader](#), [Hall Mathematics Algebra Readiness Teachers Edition](#), [Spreadsheet Modeling](#), [On Concave Lenses Middle School](#), [Digest Condensed Books Vol.2 1965](#), [This Level 3 Students Book Fascinating Stories From The Content Areas](#), [The Newspaper Worksheet](#), [Digest How To Write And Speak Better](#) [John Ellison Kahn](#)