Rarefied Gas Dynamics From Basic Concepts To Actual Calculations

The aim of this book is to present the concepts, methods and applications of kinetic theory to rarefied gas dynamics. After introducing the basic tools, problems in plane geometry are treated using approximation techniques (perturbation and numerical methods). These same techniques are later used to deal with two- and three-dimensional problems. The models include not only monatomic but also polyatomic gases, mixtures, chemical reactions. A special chapter is devoted to evaporation and condensation phenomena. Each section is accompanied by problems which are mainly intended to demonstrate the use of the material in the text and to outline additional subjects, results and equations. This will help ensure that the book can be used for a range of graduate courses in aerospace engineering or applied mathematics.

100 keV) of neutral hydrogen 7 atoms . The design of the cesium jettarget intended to achieve the 7 following goals : - Supersonic nozzle - cooled skimmer system to increase the fraction 8 of the total nozzle flux Jn which is used as the jettarget flux Jt, 8 = Jt/Jn, from low values 8

Aimed at both researchers and professionals who deal with this topic in their routine work, this introduction provides a coherent and rigorous access to the field including relevant methods for practical applications. No preceding knowledge of gas dynamics is assumed.

The book contains papers presented at the 24th International Symposium on Rarefied Gas Dynamics, a conference that is recognized as the principal forum for the presentation of recent advances in the field of rarefied gas dynamics. The topics include fundamental aspects of Boltzmann and related equations, transport theory, Monte Carlo methods, kinetic theory, gas phase molecular collision dynamics, gas surface interaction, state to state kinetics, rarefied plasmas, and non-equilibrium plasma kinetics. Applications in the fields of internal flows, vacuum systems, rarefied jets, plumes, molecular beams, scamjets and hypersonics, microflows, granular gases, electrical thrusters are discussed. Researchers in the fields of mathematics, physics, chemistry and engineering can strongly benefit from the interdisciplinary nature of the book.

The Final Proceedings for 21st International Symposium on Rarefied Gas Dynamics, 26 July 1998 - 31 July 1998. This is an interdisciplinary conference. Topics include Boltzman equation and kinetic theory; Mathematical methods and models; Flow in transitional and rarefied regimes; Numerical simulations of RGD flows; Instrumentation and diagnostics in RGD flows; Free jets and molecular beams; Elementary collisional processes; Transport and relaxation phenomena; Chemical processes; Shock waves; Low density plasmas and ionized gases; Gas-surface interactions; Molecular beams; Clusters; Aerosols; Phase change; Aerodynamics and aerothermochemistry of space vehicles; Industrial applications I (vacuum technology, thin film, microengines ...); Industrial applications II (beams, jets, lasers, reactors ...); Astrophysics; Environmental aspects.

Aerodynamics is a science engaged in the investigation of the motion of air and other gases and their interaction with bodies, and is one of the most important bases of the aeronautic and astronautic techniques. The continuous improvement of the configurations of the airplanes and the space vehicles aid the constant enhancement of their performances are closely related with the development of the aerodynamics. In the design of new flying vehicles the aerodynamics will play more and more important role. The undertakings of aeronautics and astronautics in our country have gained achievements of world interest, the aerodynamics community has made outstanding contributions for the development of these undertakings and the science of aerodynamics. To promote further the development of the aerodynamics, meet the challenge in the new century, summary the experience, cultivate the professional personnel and to serve better the cause of aeronautics and astronautics and the national economy, the present Series of Modern Aerodynamics is organized and published.

This volume is intended to coverthe presentstatus of the mathematicaltools used to deal with problems related to slow rare?ed ?ows. The meaning and usefulness of the subject, and the extent to which it is covered in the book, are discussed in some detail in the introduction. In short, I tried to present the basic concepts and the techniques used in probing mathematical questions and problems which arise when studying slow rare?ed ?ows in environmental sciences and micromachines. For the book to be up-to-date without being excessively large, it was necessary to omit some topics, which are treated elsewhere, as indicated in the introd- tion and, whenever the need arises, in the various chapters of this volume. Their omission does not alter the aim of the book, to provide an understanding of the essential mathematical tools required to deal with slow rare?ed ?ows and give the background for a study of the original literature. Although I have tried to give a rather complete bibliographical coverage,the choice of the topics and of the references certainly re?ects a personal bias and I apologize in advance for any omission. I wish to thank Lorenzo Valdettaro, Antonella Abb` a, Silva Lorenzani and Paolo Barbante for their help with pictures and especially Professor Ching Shen for his permission to reproduce his pictures on microchannel ?ows.

This report summarizes the work done at A.R.S. in the field of rarefied gas dynamics under contract with A.F.O.S.R. during the period from 1 August 1968 to 31 July 1969. After an introduction describing the essential mathematical tools for a theoretical investigation on the behavior of rarefied gases in the so-called transition regime, two main lives of work are reviewed in some detail, i.e. the research for new methods for finding approximate solutions of the linearized Boltzmann equation and the investigation of physically realistic boundary conditions to be matched with the Boltzmann equation. (Author).

Rarefied Gas Dynamics is a collection of selected papers presented at the Eighth International Symposium on Rarefied Gas Dynamics, held at Stanford University in July 1972. The book is a record of the significant advances in the broad field of Rarefied Gas Dynamics that are considered to be of general and continuing interest. The articles in this compendium are organized under 10 main topics. The text presents research papers on the kinetic theory of gases; studies and experiments on shock structures of gases; use of kinetic theory for the solution of problems in evaporation and condensation; gas expansions and jets; and techniques and methods applied to the study of rarefied gas dynamics.

The book also includes works on gas-solid interactions; descriptions of basic notions of current polyatomic gas kinetics; and observation of the gas dynamic phenomena in space. Physicists, aeronautical engineers, mechanical engineers, researchers, and students in the field of aircraft design will find this book a good source of knowledge and information.

This self-contained book is an up-to-date description of the basic theory of molecular gas dynamics and its various applications. The book, unique in the literature, presents working knowledge, theory, techniques, and typical phenomena in rarefied gases for theoretical development and application. Basic theory is developed in a systematic way and presented in a form easily applied for practical use. In this work, the ghost effect and non-Navier–Stokes effects are demonstrated for typical examples—Bénard and Taylor–Couette problems—in the context of a new framework. A new type of ghost effect is also discussed.

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Since their creation in 1958, the International Symposia on Rarefied Gas Dynamics serve as one of the main forums for the presentation of recent advances in scientific and technical fields involving physical phenomena and processes in gases in rarefied regimes. Symposia on rarefied gas dynamics are concerned with the properties and flows of rarefied gases and with the interactions of these gases with solid surfaces and force fields. The essential characteristic of a "rarefied flow" is a reasonably high Knudsen number or higher density flows where very small physical dimensions are relevant. Topics include: kinetic theory and transport phenomena; rarefied flow studies; plasma flows and processing; numerical methods; gas-surface interactions; particle models and procedures; microscale flows; multiphase flows; chemical reactions and thermal radiation; low density aerodynamics; jets, plumes, and propulsion; clusters, aerosols, and granular gases; and internal flows and vacuum systems.