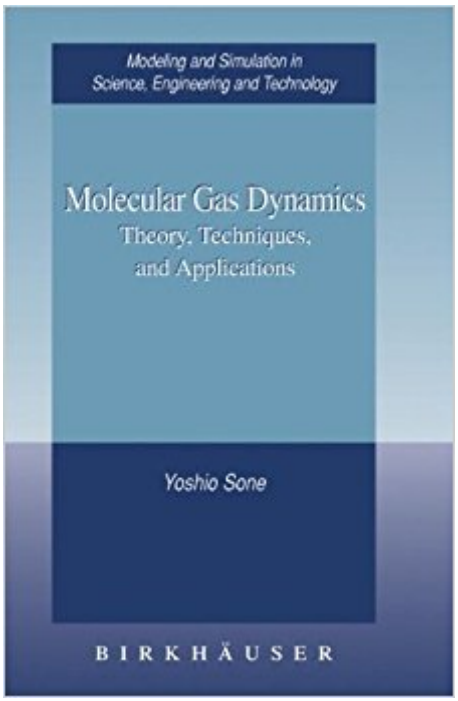
Molecular Gas Dynamics: Theory, Techniques, And Applications (Modeling And Simulation In Science, Engineering And Technology)



Synopsis

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-NavierÃ¢â ¬â œStokes effects are demonstrated for typical examplesÃ¢â ¬â ¢BÃƒÂ©nard and TaylorÃ¢â ¬â œCouette problemsÃ¢â ¬â ¢in the context of a new framework. A new type of ghost effect is also discussed.

Book Information

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Customer Reviews

From the reviews:"This is a comprehensive and self-contained text giving an overview of gas dynamics on the basis of kinetic theory in the tradition of asymptotic analysis as pursued by the author and his collaborators...[T]he treatment is lucid and self-contained, with masterfully chosen and executed expansions that do not usually find their way into textbooks...Throughout the whole book, the presentation is illustrated with numerical graphs and tables based on widely varying numerical methods chosen with regard to the respective problems. Clarifying footnotes are generously provided, useful both for the beginner and for the experienced user. An added bonus is accurate and up-to-date surveys of the mathematical status of the various problems together with an in-depth bibliography. This impressive monograph...will become a convenient and lasting

reference in the area."Ã Â Ã Â Ã¢â ¬â ¢Transport Theory and Statistical Physics"In this book the author presents a good review of the theory and the modeling of molecular gas dynamics, together with applications, based on his work with his collaborators. This book is a good reference for researchers interested in applications to kinetic theory and fluid dynamics."Ã Â Ã Â Ã¢â ¬â ¢Mathematical ReviewsÃ¢â ¬Å“The monograph provides a comprehensive and self-contained overview of gas dynamics based on the kinetic theory. Ã¢â ¬Â¦ The presentation is supplemented with illustrations and tables demonstrating the numerical methods suitable for the respective problems. An up-to-date survey of the current status of research in the various areas is given together with an extensive bibliography. The book can serve as a self-study reference or as a textbook.Ã¢â ¬Â• (Jan Stebel, Applications of Mathematics, Vol. 56, 2011)

This self-contained work is an up-to-date treatment of the basic theory of molecular gas dynamics and its various applications. Recent progress in the field has greatly enhanced the original theory and stimulated interesting and critical gas dynamic phenomena and problems. This book, unique in the literature, presents working knowledge, theory, techniques, and typical phenomena in rarefied gases for theoretical development and applications. Ã Â Basic theory is developed in a systematic way and presented in a form easily applied to practical use. After presenting basic theory and various simple flows, such as unidirectional or quasi-unidirectional flows and flows around a sphere, the author discusses additional topics, including flows induced by temperature fields, which are typical in rarefied gases; flows with evaporation and condensation; and bifurcation of flows in rarefied gases. The appendix contains many useful fundamental formulae, as well as an explanation of the theoretical background for the direct simulation Monte Carlo (DSMC) method, easily accessible to nonmathematicians and not found elsewhere in the literature. Existence of the ghost effect has made molecular gas dynamics indispensable to the study of a gas in the continuum limit, traditionally treated by classical fluid dynamics. In this book, the ghost and non-NavierÃ¢â ¬â œStokes effects are demonstrated for typical examplesÃ¢â ¬â ¢such as BÃƒÂ©nard and TaylorÃ¢â ¬â œCouette problemsÃ¢â ¬â ¢in the context of a new framework. An infinitesimal curvature effect is also discussed, with a long-standing problem of the bifurcation of the plane Couette flow worked out as an example. Molecular Gas Dynamics is useful for those working in different communities where kinetic theory or fluid dynamics is important: graduate students, researchers, and practitioners in theoretical physics, applied mathematics, and various branches of engineering. The work may be used as a self-study reference or as a textbook in graduate-level courses on fluid dynamics, gas dynamics, kinetic theory, molecular or rarefied gas dynamics,

microflows, and applied mathematics.

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