Contents of Volume 1

1: Kinetic Theory and Transport Theory 1

The Kinetic Theory of High Threshold Reactions and Dissociation in Gas Flow
N.K. Makashev 3

Exact Non-linear Transport from the Boltzmann Equation
Andrés Santos and Vicente Garzó 13

On the Solution of the Nonlinear Boltzmann Equation
N. Bellomo, P. LeTallec and B. Perthame 23

A Rarefied Gas Flow Induced by a Temperature Field
Kazuo Aoki, Yoshio Sone and Noboru Masukawa 35

Spatial Relaxation Processes and the Possible Decreasing of Entropy
V.V. Aristov 43

Mutual Diffusion Tensor of a Dilute Gas in a Thermostatted Shear Flow State
V. Garzó and M. López de Haro 50

Kinematics of Moment of One-Particle Distribution Function
M. Grmela and G. Lebon 57

Applications of Function Approximation Methods to Computational Schemes for Discrete Boltzmann Equation
M. Hatakeyama, S. Sugano and A. Takaada 64

Knudsen Number Expansions for Kinetic Boundary Layers around a Sphere
A.J. Kainz and U.M. Titulaer 71

New Kinetic Model of Transport Processes in the Strong Nonequilibrium Gas
E.V. Kustova and E.A. Nagnibeda 78

Nonlinear Particle Trajectories and the Damping of Waves in Rarefied Plasmas
C. Lancellotti and J. Dorning 85

Flow of Slightly Rarefied Gas Past a Liquid Sphere
M. Tomoeda 93

A Second-Order WKB Analysis of Electron Thermalization and Attachment in Gases
Takeo Nishigori 100

On Convergence to Equilibrium for the Linear Boltzmann Equation without Detailed Balance Assumptions
R. Pettersson 107

Quantum Collisional Transfer Contributions to the Density Dependence of Gaseous Viscosity
J.C. Rainwater 114

A Boltzmann Model with Discrete Velocity Moduli for a Mixture of Reacting Gases
Alberto Rossani 121

The Peculiarities of Diffusion Processes in Gas Mixture of VHS Molecules
A.K. Rebrov and P.A. Skovorodko 128

The Bénard Problem of Rarefied Gas Dynamics
Yoshio Sone, Kazuo Aoki, Hiroshi Sugimoto and Hideto Motohashi 135

Extensions of Maxwell's Elementary Kinetic Theory of the Behavior of a Semi-Infinite Isothermal Ideal Gas Column in a Gravitational Field
Harold Y. Wachman 142

Thermal Waves
L.C. Woods 149

Concentration Jump for a Multicomponent Gas Mixture
J.Y. Zhao, C. Shen and J.R. Tang 156

Quantum-Mechanical Density Correction in μ-Space Kinetics
K. Bärwinkel 163

High Energy Asymptotic Solutions of the Boltzmann Equation
A.V. Bobylev 170

Transport Properties of Gas-Phase N_2 and CO
E.L. Heck and A.S. Dickinson 177

Derivation of a Diffusion Term in Boltzmann Equation
T.G. Elizarova and A.A. Gogolin 185

Solution of Kinetic Equations for Dense Gases
W. Greenberg, Lei Peng, Liu Rong and Aixiang Yao 192

A Comparison between Two Solution Methods for Kinetic Boundary Layer Problems in the Linear and Nonlinear BGK Model
C.J. Kloimböck and U.M. Titulaer 198

Equilibrium Solutions of the Boltzmann Equation for an Electron Gas in a Semiconductor
A. Majorana 205

A Semi-Analytical Technique for Driven Plasma Oscillation Analysis
Vincenzo G. Molinari, Marco Summini, Paolo Peerani and Barry D. Ganapol 209

A Triangular 2-Speed Boltzmann Gas with Multiple Collisions: Shock Wave Profiles, Stability
T. Platkowski 216

Nonlocal Solutions of the Boltzmann Equation
V.Ya. Rudyak 223

Balance Equations for Hermitian Moments in Mixtures of Rarefied Gases
K. Suchy 230

Rarefied Gas Flow of a Ternary Mixture over a Catalytic Wall
Kyoji Yamamoto and Toshiyuki Nishitani 237

Momentum Transport in a Dilute Binary Mixture
C. Marín and V.Garzó 244

2: Gas Beams, Clusters, Aerosols, Condensation and Evaporation 251

Evaporation/Condensation Kinetics
M.N. Kogan 253

The Field of Molecular Beam Degradation in a Target Gas
A.K. Rebrov and B.L. Paklin 263

Scaling Parameters for Predicting Cluster Sizes in Free Jets
Eldon L. Knuth, Bernard Schilling and J. Peter Toennies 270

Cluster Beam Deposition: Optimization of a Silver Cluster Beam Source
P. Gatz and O.F. Hagena 277

Transient Behavior of a Vapor due to Evaporation and Condensation between the Plane Condensed Phases
Yoshomoto Onishi and Hidekatzu Tsuji 284

Strong Evaporation in a Dusty Polyatomic Gas
Svend Ostmo and Tor Ytrehus 291

DSMC Analysis of the Evaporation of Iodine between Parallel Plates
Aldo Frezzotti and Stefan Stefanov 298

On the Condensation of Nitrogen in Rarefied Flow
Terrence M. Cain 305

Nucleation Kinetics in Vapor with a Nonequilibrium State of Internal Degrees of Freedom of Molecules
S.P. Fisenko 312

Kinetic Theory of Heterogeneous Nucleation on Charged Particles
A.L. Itkin 316

The Rate Constants of the Unimolecular Decay and Condensation Coefficients of Neutral Clusters and Cluster Ions
A.L. Itkin 323

Theoretical Investigation of the Cluster Size Distribution in Nozzles and Jets
A.L. Itkin and A.V. Rodionov 331

Strong Condensation and Sonoluminescence
A.P. Kryukov and V.N. Zhukov 338

3: Internal Flows 345

Slip Flow in Microchannels
Errol B. Arkilic, Martin A. Schmidt and Kenneth S. Breuer 347

Comparison of Solutions of the Burnett Equations, Navier-Stokes Equations and DSMC for Couette Flow
Xiaolin Zhong and Katsuhisa Koura 354

Direct Simulation of Thermally Induced Flows
T. Soga, Y. Iwayama and H. Oguchi 361

Light-Induced Drift of a One-Component Gas in a Capillary
V.G. Chernyak, E.A. Vilisova and E.A. Subbotin 368

Flow of a Rarefied Gas in a Rectangular Channel with a Moving Plate
Tatsuo Kanki 375

Precise Discharge Characteristics of Rarefied Critical Flows through a Parallel Plate Channel
T. Taguchi, K. Yanagi, M. Miyamoto and T. Nagata 382

Direct Simulation Monte Carlo on Taylor Vortex Flow
M. Usami 389

4: Collision Dynamics, Relaxation Processes, Reaction Rates and Shocks 397

DSMC Simulation of Thermal Nonequilibria using Attractive-Repulsive Intermolecular Potentials
I. Choquet 399

Comparison of Classical and Quasiclassical Methods of Exchange Coefficients Calculation
M.P. Krutikov 406

Comparison of DSMC Flowfield Predictions using Different Models for Energy Exchange and Chemical Reaction Probability
P.M. Marriott and T.J. Bartel 413

A Model for Rotational Energy Transfer in Nitrogen
Christian Bartels and Alfred E. Beylich 420

Vibration-Dissociation Coupling Revisited by a Chapman-Enskog Procedure
R. Brun and M. Llorca 427

Implementation of a Vibrationally Linked Chemical Reaction Model for DSMC
Ann B. Carlson and G.A. Bird 434

Islands of Instability during Chemical Processes behind Incident Shock Waves
Z. Cheng, D.N.S. Permann, J.Z. Su, and H. Teitelbaum 441

A Sterically Dependent Chemical Reaction Model
Jing Fan and Ching Shen 448

The Propagation of Shock Waves in a Dense Gas according to Enskog Theory
Aldo Frezzotti 455

On the Vibrational-Rotational Energy Exchange Process during Molecular Collisions
Yu.E. Gorbachev 462

Monte Carlo Simulation of Vibrational Energy Relaxation in Rarefied Gas Flows
C. Shen, Z.H. Hu, X.Y. Xu and J. Fan 469

Rotational Relaxation Analysis of Nitrogen in Low-Density Freejet Expansions
Lawrence A. Gochberg and Brian L. Haas 476

Molecular Models for Monte Carlo Simulation of Rarefied Real Gases
Katsuhisa Koura 483

Semi Quantum Maximum Entropy Approach to Energy Exchange
P.M. Marriott 490

The Reaction A + A→B + B: Nonequilibrium Reactive Effects
Duncan Napier and Bernie D. Shizgal 496

A New Monte Carlo Algorithm of Linear Approach for Gasdynamic Problems
B.L. Paklin 503

The Larsen-Borgnakke Distributions as Prior Distributions in the Maximum Entropy Method
Michael A. Gallis and John K. Harvey 507

On Appropriate Boundary Conditions for Rarefied Gas Shock Wave Calculations
Jason M. Reese, Frank Thiele and Leslie C. Woods 514

Properties of an Argon Plasma Free Jet produced from a Continuous Optical Discharge
J.M. Girard, A. Lebéhot and R. Campargue 521

Boundary Conditions for Reflection of a Moving Shock Wave
Kerstin Kantiem, Artur Kozlowski and Zbigniew A. Walenta 528

Level Approach in the Chemical and Vibrational Relaxation Theory
E.A. Nagnibeda 535

DSMC Simulation of Overheating through Atomic Inelastic Collisions in a Metal Vapour Jet Expansion
J.L. Fleche and C. Gonella 542

Experimental Investigation of the Triple Point Trajectory.
J. Fuchs and B. Schmidt 549

Real Gas Effects on the Aerodynamcis of 2D Concave Bodies in the Transitional Regime
S.F. Gimelshein, M.S. Ivanov, A.V. Kashkovsky and Yu.E. Gorbachev 556

A New Model of Energy Exchange in Inelastic Collisions
R.G. Lord 564

Vibration-Dissociation Coupling behind a Plane Shock Wave
J.G. Meolans, M. Mouti, F. Lordet and A. Chauvin 571

Relaxing Gas of Anharmonic Oscillators. Kinetics and Gasdynamics
M.A. Rydalevskaya 578

Velocity Distributions of Ground and Metastable Atoms in Heavy Metal Vapor Produced by Electron Beam Bombardment
Kazumichi Suzuki, Masahiro Tooma, Takashi Asano and Kazuki Tsuchida 585

Comparison of DSMC Predictions with Temporally Resolved Vibrational State Measurements in NO
Ingrid J. Wysong and David H. Campbell 592

5: Ionized Gas Flows, Plasma Processing and Electron Impact 599

Application of Particle Simulation to Plasma Processing
K. Nanbu and S. Uchida 601

Low Density Gas Modelling in the Microelectronics Industry
T.J. Bartel 611

The Boundary of a Fusion Plasma: Some Problems in Rarefied Gas/Plasma Dynamics
P.J. Harbour 621

Nonlinear Wave-Packets in Rarefied Plasmas
Mark Buchanan and J.J. Dorning 631

Beam-Plasma Interaction and Asymmetric Solitary Waves in Rarefied Plasmas
Paul C. Kirkitelos, Mark Buchanan and J.J. Dorning 638

A Discrete Velocity Model for Relaxation of Anisotropic Distribution Functions
Andrew Irwin and Bernie D. Shizgal 645

Perturbations and Instabilities of a Rarefied Plasma in a Strong Electric Field
M.V. Anolik, E.N. Perevoznikov and G.E. Skvortsov 652

Monte-Carlo Simulation for Electron-Beam Plasma
V.S. Malinovsky and A.V. Vasenkov 659

Flowfield Properties under Gas-Jet Deposition of Films
A.V. Vasenkov, A.E. Belikov, R.G. Sharafutdinov and O.V. Kuznetsov 665

Plasma CVD Assisted by Selective Radical Source and its Application to Synthesis of Diamond
M. Hiramatsu, M. Inayoshi, K. Yamada, T. Nakahira, M. Nawata, M. Ikeda, M. Hori and T. Goto 671

Boltzmann Equation Analysis for Electron Distribution Function in Electron-Beam Plasma
V.S. Malinovsky 678

Depth and Path Length Distributions of Electrons Backscattered Elastically from Solids
R. Chakarova and I. Pazsit 685

Monte Carlo Simulation of Sputter-Deposited Film Growth in 3D Rarefied Flows
V.V. Serikov and K. Nanbu 692

6: Other Topics 699

Transient Normal Forces on Rapidly Heated Surfaces with Applications to Micromechanical Devices
G. Pham-Van-Diep, E.P. Muntz and D.C. Wadsworth 701

Crookes' Radiometer and Micromechanical Actuators
D.C. Wadsworth, E.P. Muntz, G. Pham-Van-Diep and P. Keeley 708

A Micromechanical Knudsen Number Compressor
G. Pham-Van-Diep, P. Keeley, E.P. Muntz and D.P. Weaver 715

Direct Simulation of Gas Flows around Rarefied Gas Dynamics Engines for a Micro-Machine
Masahiro Ota and Noriyuki Katawa 722

A Geometrical Augmented Inertially Tethered Charge Exchanger for the Production of Energetic Oxygen Atoms
A.D. Ketsdever, D.P. Weaver and E.P Muntz 729

Object-Process Paradigms in Molecular Computation
Timothy L. Parsons and John K. Harvey 736

Author Index xxix

Subject Index xxxiii