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Nota di contenuto	CHEMICALLY REACTING FLOW; CONTENTS; Preface; Acknowledgments; Nomenclature; 1 Introduction; 1.1 Objectives and Approach; 1.2 Scope; 2 Fluid Kinematics; 2.1 What is a Fluid?; 2.2 The Path to the Conservation Equations; 2.3 The System and the Control Volume; 2.4 Stress and Strain Rate; 2.5 Fluid Strain Rate; 2.6 Vorticity; 2.7 Dilatation; 2.8 The Stress Tensor; 2.9 Stokes' Postulates; 2.10 Transformation from Principal Coordinates; 2.11 Stokes Hypothesis; 2.12 Summary; Problems; 3 The Conservation Equations; 3.1 Mass Continuity; 3.2 Brief Discussion on Equation of State 3.3 Brief Discussion of Viscosity3.4 Navier-Stokes Equations; 3.5 Brief Discussion on Species Diffusion; 3.6 Species Conservation; 3.7 Brief Discussion on Thermal Conductivity; 3.8 Conservation of Energy; 3.9 Mechanical Energy; 3.10 Thermal Energy; 3.11 Perfect Gas and Incompressible Fluid; 3.12 Conservation Equation Summary; 3.13 Pressure Filtering; 3.14 Mathematical Characteristics; 3.15 Summary;

Problems; 4 Parallel Flows; 4.1 Nondimensionalization of Physical Problems; 4.2 Couette and Poiseuille Flow; 4.3 Hagen-Poiseuille Flow in a Circular duct; 4.4 Ducts of Noncircular Cross Section 4.5 Hydrodynamic Entry Length 4.6 Transient Flow in a Duct; 4.7 Richardson Annular Overshoot; 4.8 Stokes Problems; 4.9 Rotating Shaft in Infinite Media; 4.10 The Graetz Problem; Problems; 5 Similarity and Local Similarity; 5.1 Jeffery-Hamel Flow; 5.2 Planar Wedge Channel; 5.3 Radial-Flow Reactors; 5.4 Spherical Flow between Inclined Disks; 5.5 Radial Flow between Parallel Disks; 5.6 Flow between Plates with Wall Injection; 5.7 General Curvilinear Coordinates; Problems; 6 Stagnation Flows; 6.1 Similarity Assumptions in Axisymmetric Stagnation Flow 6.2 Generalized Steady Axisymmetric Stagnation Flow 6.3 Semi-infinite Domain; 6.4 Finite-Gap Stagnation Flow; 6.5 Numerical Solution; 6.6 Rotating Disk; 6.7 Rotating Disk in a Finite Gap; 6.8 Unified View of Axisymmetric Stagnation Flow; 6.9 Planar Stagnation Flows; 6.10 Opposed Flow; 6.11 Tubular Flows; Problems; 7 Channel Flow; 7.1 Scaling Arguments for Boundary Layers; 7.2 General Setting Boundary-Layer Equations; 7.3 Boundary Conditions; 7.4 Von Mises Transformation; 7.5 Introduction to the Method of Lines; 7.6 Channel Boundary Layer as DAEs; 7.7 General Von Mises Boundary Layer 7.8 Hydrodynamic Entry Length 7.9 Limitations; 7.10 Solution Software; Problems; 8 Statistical Thermodynamics; 8.1 Kinetic Theory of Gases; 8.2 Molecular Energy Levels; 8.3 The Boltzmann Distribution; 8.4 The Partition Function; 8.5 Statistical Thermodynamics; 8.6 Example Calculations; Problems; 9 Mass Action Kinetics; 9.1 Gibbs Free Energy; 9.2 Equilibrium Constant; 9.3 Mass-Action Kinetics; 9.4 Pressure-Dependent Unimolecular Reactions; 9.5 Bimolecular Chemical Activation Reactions; Problems; 10 Reaction Rate Theories; 10.1 Molecular Collisions; 10.2 Collision Theory Reaction Rate Expression 10.3 Transition-State Theory

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## Sommario/riassunto

Complex chemically reacting flow simulations are commonly employed to develop quantitative understanding and to optimize reaction conditions in systems such as combustion, catalysis, chemical vapor deposition, and other chemical processes. Although reaction conditions, geometries, and fluid flow can vary widely among the applications of chemically reacting flows, all applications share a need for accurate, detailed descriptions of the chemical kinetics occurring in the gas-phase or on reactive surfaces. Chemically Reacting Flow: Theory and Practice combines fundamental concepts in fluid mechan

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