

PREMIER REFERENCE SOURCE

# Computational Gas-Solids Flows and Reacting Systems

Theory, Methods and Practice



Sreekanth Pannala, Madhava Syamlal, & Thomas J. O'Brien

# Table of Contents

<b>Foreword .....</b>	xiv
<b>Preface .....</b>	xvi
<b>Section 1</b>	
<b>Theory</b>	
<b>Chapter 1</b>	
Multiphase Continuum Formulation for Gas-Solids Reacting Flows.....	1
<i>Madhava Syamlal, National Energy Technology Laboratory, USA</i>	
<i>Sreekanth Pannala, Oak Ridge National Laboratory, USA</i>	
<b>Chapter 2</b>	
Hydrodynamic Equations from Kinetic Theory: Fundamental Considerations.....	66
<i>James W. dusty, University of Florida, USA</i>	
<i>Aparna Baskaran, Syracuse University, USA</i>	
<b>Chapter 3</b>	
Kinetic Theory for Granular Materials: Polydispersity .....	102
<i>Christine M. Hrenya, University of Colorado, USA</i>	
<b>Chapter 4</b>	
Interfacial Interactions: Drag .....	128
<i>Wei Ge, Chinese Academy of Sciences, China</i>	
<i>Ning Yang, Chinese Academy of Sciences, China</i>	
<i>Wei Wang, Chinese Academy of Sciences, China</i>	
<i>Jinghai Li, Chinese Academy of Sciences, China</i>	
<b>Chapter 5</b>	
Mass and Heat Transfer Modeling .....	178
<i>Ronald W. Breault, National Energy Technology Laboratory, USA</i>	

## Section 2

### Numerical Methods

<b>Chapter 6</b>	
Coupled Solvers for Gas-Solids Flows.....	204
<i>Berend van Wachem, Imperial College, UK</i>	
<b>Chapter 7</b>	
Quadrature-Based Moment Methods for Polydisperse Gas-Solids Flows .....	221
<i>Alberto Passalacqua, Iowa State University, USA</i>	
<i>Prakash Vedula, University of Oklahoma, USA</i>	
<i>Rodney O. Fox, Iowa State University, USA</i>	
<b>Chapter 8</b>	
Direct Numerical Simulation of Gas-Solids Flow Based on the Immersed Boundary Method .....	245
<i>Rahul Garg, Iowa State University, USA</i>	
<i>Sudheer Tenneti, Iowa State University, USA</i>	
<i>Jamaludin Mohd. Yusof, Los Alamos National Laboratory, USA</i>	
<i>Shankar Subramaniam, Iowa State University, USA</i>	
<b>Chapter 9</b>	
The Multiphase Particle-in-Cell (MP-PIC) Method for Dense Particle Flow .....	277
<i>Dale M. Snider, CFD, USA</i>	
<i>Peter J. O'Rourke, CFD, USA</i>	

## Section 3

### Practice

<b>Chapter 10</b>	
Circulating Fluidized Beds .....	316
<i>Ray Cocco, PSRI, USA</i>	
<i>S.B. Reddy Karri, PSRI, USA</i>	
<i>Ted Knowlton, PSRI, USA</i>	
<b>Chapter 11</b>	
CFD Modeling of Bubbling Fluidized Beds of Geldart A Powders .....	357
<i>T. Pugsley, The University of Saskatchewan, Canada</i>	
<i>S. Karimipour, The University of Saskatchewan, Canada</i>	
<i>Z. Wang, The University of Saskatchewan, Canada</i>	

**Chapter 12**

- Computational Modeling of Gas-Solids Fluidized-Bed Polymerization Reactors ..... 373

*Ram G. Rokkam, Iowa State University, USA*

*Rodney O. Fox, Iowa State University, USA*

*Michael E. Muhle, Univation Technologies, USA*

**Chapter 13**

- Validation Approaches to Volcanic Explosive Phenomenology ..... 398

*Sébastien Darteville, Los Alamos National Laboratory, USA*

- Compilation of References** ..... 430

- About the Contributors** ..... 467

- Index** ..... 471