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Nota di contenuto	1. Introduction. 1.1. Historical background. 1.2. Terminology and nomenclature. 1.3. Examples of applications in science and technology -- 2. Fundamental equations and characteristics of particles, bubbles and drops. 2.1. Fundamental equations of a continuum. 2.2. Conservation equations for a single particle, bubble or drop. 2.3. Characteristics of particles, bubbles and drops. 2.4. Discrete and continuous size distributions -- 3. Low Reynolds number flows. 3.1. Conservation equations. 3.2. Steady motion and heat/mass transfer at creeping flow. 3.3. Transient, creeping flow motion. 3.4 Transient heat/mass transfer at creeping flow. 3.5. Hydrodynamic force and heat transfer for a spheroid at creeping flow. 3.6. Steady motion and heat/mass transfer at small Re and Pe. 3.7. Transient hydrodynamic force at small Re. 3.8. Transient heat/mass transfer at small Pe -- 4. High Reynolds number flows. 4.1. Flow fields around rigid and fluid spheres. 4.2. Steady hydrodynamic force and heat transfer. 4.3. Transient hydrodynamic force. 4.4. Transient heat transfer -- 5. Non-

spherical particles, bubbles and drops. 5.1. Transport coefficients of rigid particles at low Re. 5.2. Hydrodynamic force for rigid particles at high Re. 5.3. Heat transfer for rigid particles at high Re. 5.4. Non-spherical bubbles and drops -- 6. Effects of rotation, shear and boundaries. 6.1. Effects of relative rotation. 6.2. Effects of flow shear. 6.3. Effects of boundaries. 6.4. Constrained motion in an enclosure. 6.5. Effects of boundaries on bubble and drop deformation. 6.6. A note on the lift force in transient flows -- 7. Effects of turbulence. 7.1. Effects of free stream turbulence. 7.2. Turbulence modulation. 7.3. Drag reduction. 7.4. Turbulence models for immersed objects. 7.5. Heat transfer in pipelines with particulates. 7.6. Turbophoresis and wall deposition. 7.7. Turbulence and coalescence of viscous spheres -- 8. Electro-kinetic, thermo-kinetic and porosity effects. 8.1. Electrophoresis. 8.2. Brownian motion. 8.3. Thermophoresis. 8.4. Porous particles -- 9. Effects of higher concentration and collisions. 9.1. Interactions between dispersed objects. 9.2. Effects of concentration. 9.3. Collisions of spheres. 9.4. Collisions with a wall-mechanical effects. 9.5. Heat transfer during wall collisions -- 10. Molecular and statistical modeling. 10.1. Molecular dynamics. 10.2. Stokesian dynamics. 10.3. Statistical methods -- 11. Numerical methods-CFD. 11.1 Forms of Navier-Stokes equations used in CFD. 11.2. Finite difference method. 11.3. Spectral and finite-element methods. 11.4. The Lattice-Boltzmann method. 11.5. The force coupling method. 11.6. Turbulent flow models. 11.7. Potential flow-boundary integral method.

Sommario/riassunto

The field of multiphase flows has grown by leaps and bounds in the last thirty years and is now regarded as a major discipline. Engineering applications, products and processes with particles, bubbles and drops have consistently grown in number and importance. An increasing number of conferences, scientific fora and archived journals are dedicated to the dissemination of information on flow, heat and mass transfer of fluids with particles, bubbles and drops. Numerical computations and "thought experiments" have supplemented most physical experiments and a great deal of the product design and testing processes. The literature on computational fluid dynamics with particles, bubbles and drops has grown at an exponential rate, giving rise to new results, theories and better understanding of the transport processes with particles, bubbles and drops. This book captures and summarizes all these advances in a unified, succinct and pedagogical way. Contents: Fundamental Equations and Characteristics of Particles, Bubbles and Drops; Low Reynolds Number Flows; High Reynolds Number Flows; Non-Spherical Particles, Bubbles and Drops; Effects of Rotation, Shear and Boundaries; Effects of Turbulence; Electro-Kinetic, Thermo-Kinetic and Porosity Effects; Effects of Higher Concentration and Collisions; Molecular and Statistical Modeling; Numerical Methods-CFD. Key Features Summarizes the recent important results in the theory of transport processes of fluids with particles, bubbles and drops Presents the results in a unified and succinct way Contains more than 600 references where an interested reader may find details of the results Makes connections from all theories and results to physical and engineering applications Readership: Researchers, practicing engineers and physicists that deal with any aspects of Multiphase Flows. It will also be of interest to academics and researchers in the general fields of mechanical and chemical engineering.