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Nota di contenuto	List of Symbols xv -- List of Figures xxi -- List of Tables xxv -- 1 Introduction: Spray Drying and Reactive Drying Processes 1 -- 1.1 Spray Polymerisation. 2 -- 1.2 Single Droplet Models for Spray Drying . 3 -- 1.3 Meshfree Methods, Simulation of Structure Evolution4 -- 1.3.1 Previous Applications of SPH to Drying . 5 -- 2 Theoretical Principles 7 -- 2.1 Transport Equations 7 -- 2.1.1 Transport in a Mass Averaged System 9 -- 2.1.2 Transport in a Molar Averaged System . 13 -- 2.1.3 Reference Velocities and Conversion between Systems . 13 -- 2.1.4 Eulerian and Lagrangian Frames of Reference16 -- 2.2 Diffusion . 17 -- 2.2.1 Fickian Diffusion . 17 -- 2.2.2 Maxwell-Stefan Diffusion 19 -- 2.2.3 Determination of Diffusion Coefficients . 21 -- 2.3 Modelling of Free Radical Polymerisation 21 -- 2.3.1 Reactions in Free Radical Polymerisation 22 -- 2.3.2 Quasi-Steady-State Assumption (QSSA) 27 -- 2.3.3 Method of Moments . 28 -- 2.4 Mixture Thermodynamics 31 -- 2.4.1 Vapour Liquid Equilibrium at the Droplet's Surface . 32 -- 2.4.2 Calculation of Activity Coefficients . 33 -- 2.4.3 The UNIFAC Equations . 34 -- 2.5 Spray Drying: Basic Assumptions 35 -- 2.5.1 Approximate Residence Time in a Spray Dryer . 36 -- 2.5.2 Heat and Mass Transfer . 37 -- 2.5.3 Inner Circulation Inside a Droplet 38 -- 2.5.4 Are Droplets Fully Mixed? 40 -- 3 Modelling of Reactive Droplet Drying and Polymerisation 41 -- 3.1 Transport in a Reaction-Diffusion System 42 -- 3.1.1 Constant Physical Properties. 44 -- 3.1.2 Consideration of Mixture Effects . 46

Sommario/riassunto

Spray polymerisation has a long time been discussed as a promising process, yet, with little knowledge on cause-and-effect relationships between drying and chemical reactions. This work develops a new single droplet model of combined solution drying and free radical homopolymerisation, based on the method of moments. New, consistent approaches for moments' diffusion and the reaction-diffusion system are derived to ensure conservation. Simulations reveal peculiarities of the process such as that, due to drying, polymerisation happens mostly in bulk and monomer evaporation leads to a poor yield. Various process variants and simulation models are discussed. The impact of process parameters is examined by means of numerical DoEs. The second part presents a novel approach for the simulation of structure evolution in suspension drying. The meshfree SPH method is used to model the relevant physical effects on a detailed scale during the first and second drying period. New implementations of physical effects are derived: heat and mass transfer based on linear driving forces, an implicit solution of the heat equation, several approaches for crust formation and a new formulation of surface tension by pairwise forces. The formation of dense structures as well as hollow granules can be simulated. Model parameters influence crust formation during the second drying period concerning shape and microporosity and can be interpreted in a physical sense.

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Soggetti	History of engineering and technology
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Sommario/riassunto	Remote image capture systems are a key element in efficient and sustainable agriculture nowadays. They are increasingly being used to obtain information of interest from the crops, the soil and the environment. It includes different types of capturing devices: from satellites and drones, to in-field devices; different types of spectral information, from visible RGB images, to multispectral images; different types of applications; and different types of techniques in the areas of image processing, computer vision, pattern recognition and machine learning. This book covers all these aspects, through a series of chapters that describe specific recent applications of these techniques in interesting problems of agricultural engineering.