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Scope and Definitions; 3.2 Process Intensification in the Field of Reaction Engineering; 3.3 Process Intensification through Micro-structured Unit Operations; 3.3.1 Gas Phase Mass Transfer; 3.3.2 Liquid-Liquid Mass Transfer: Mixing and Emulsions
3.3.3 Gas-Liquid Mass Transfer3.3.4 Mass Transfer in Gas-Solid Systems; 3.3.5 Heat Transfer; 3.4 Case Studies; 3.4.1 Distributed Production of Methanol; 3.4.2 Distributed Production of Hydrogen; 3.5 Conclusions; References; 4 High Throughput Research; 4.1 Introduction; 4.2 Description of Terms; 4.3 Concept of a Research Process; 4.4 High Throughput Analytical; 4.5 Extracting Information from the Process; 4.6 Process Development becomes the Next Bottleneck; 4.7 Use of High Throughput Concepts for Process Development; 4.8 Microreactors for Process Development
4.9 Current Barriers and Limitations to Microscale Reaction Characterization4.10 Conclusion; References; Part II Technology Developments and Case Studies; 5 Introduction; 6 Microreactor Concepts and Processing; 6.1 Introduction; 6.2 Microreactor Technology - Interfacing and Discipline Cross-boundary Research; 6.3 Microstructured Mixer-reactors for Pilot and Production Range and Scale-out Issues; 6.3.1 Caterpillar Microstructured Mixer-reactors; 6.3.2 StarLam Microstructured Mixer-reactors; 6.3.3 Microstructured Heat Exchanger-reactors; 6.4 Fine-chemical Microreactor Plants
6.4.1 Laboratory-range Plants6.4.2 Pilot-range Plants; 6.5 Industrial Microreactor Process Development for Fine and Functional Chemistry; 6.5.1 Phenyl Boronic Acid Synthesis (Scheme 6.1) (Clariant/Frankfurt + IMM); 6.5.1.1 Process Development Issue; 6.5.1.2 Microreactor Plant and Processing Solution; 6.5.2 Azo Pigment Yellow 12 Manufacture (Scheme 6.2) (Trust Chem/Hangzhou + IMM); 6.5.2.1 Process Development Issue; 6.5.2.2 Microreactor Plant and Processing Solution; 6.5.3 Hydrogen Peroxide Synthesis (UOP/Chicago + IMM); 6.5.3.1 Process Development Issues
6.5.3.2 Microreactor Plant and Processing Solution

Sommario/riassunto

This first comprehensive treatment of the intertwined roles of micro-instrumentation, high throughput experimentation and process intensification as valuable tools for process analytical technology covers both industrial as well as academic aspects. First class editors and authors from top companies and universities provide interdisciplinary coverage ranging from chemistry and analytics to process design and engineering, supported throughout by case studies and ample analytical data.