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3.3.3 Heat Transfer in Stirred Vessel with SCFs; 3.4 Conclusions; Notation; References; 4 Kinetics of Free-Radical Polymerization in Homogeneous Phase of Supercritical Carbon Dioxide; 4.1 Introduction; 4.2 Experimental; 4.3 Initiation; 4.4 Propagation
4.4.1 Propagation Rate Coefficients4.4.2 Reactivity Ratios; 4.5 Termination; 4.6 Chain Transfer; 4.7 Conclusions; Notation; References; 5 Monitoring Reactions in Supercritical Media; 5.1 Introduction; 5.2 On-line Analytical Methods Used in SCF; 5.2.1 Spectroscopic Methods; 5.2.1.1 FTIR; 5.2.1.2 Raman Spectroscopy; 5.2.1.3 UV/Vis; 5.2.1.4 NMR; 5.2.2 Reflectometry; 5.2.3 Acoustic Methods; 5.3 Calorimetric Methods; 5.3.1 Power Compensation Calorimetry; 5.3.2 Heat Flow Calorimetry; 5.3.2.1 Heat Balance Equations [27]; 5.3.2.2 Determination of Physico-Chemical Parameters 5.3.2.3 Calorimeter Validation by Heat Generation Simulation5.4 MMA Polymerization as an Example; 5.4.1 Calorimetric Results; 5.4.2 The Coupling of Calorimetry and On-Line Analysis; 5.5 Conclusions; Notation; References; 6 Heterogeneous Polymerization in Supercritical Carbon Dioxide; 6.1 Introduction; 6.2 Literature Review; 6.3 Modeling of the Process; 6.4 Case Study I: MMA Dispersion Polymerization; 6.5 Case Study II: VDF Precipitation Polymerization; 6.6 Concluding Remarks and Outlook; Notation; References; 7 Inverse Emulsion Polymerization in Carbon Dioxide; 7.1 Introduction
7.2 Inverse Emulsion Polymerization in CO(2): Design Constraints7.3 Surfactant Design for Inverse Emulsion Polymerization; 7.3.1 Designing CO(2)-philic Compounds: What Can We Learn from Fluoropolymer Behavior?; 7.3.2 Non-Fluorous CO(2)-Philes: the Role of Oxygen; 7.4 Inverse Emulsion Polymerization in CO(2): Results; 7.5 Future Challenges; References; 8 Catalytic Polymerization of Olefins in Supercritical Carbon Dioxide; 8.1 Introduction; 8.2 Phase Behavior of Polyolefin-Monomer-CO(2) Systems; 8.2.1 Cloud-Point Measurements on the PEP-Ethylene-CO(2) System
8.2.2 SAFT Modeling of the PEP-Ethylene-CO(2) System

Sommario/riassunto

Recently, supercritical fluids have emerged as more sustainable alternatives for the organic solvents often used in polymer processes. This is the first book emphasizing the potential of supercritical carbon dioxide for polymer processes from an engineering point of view. It develops a state-of-the-art overview on polymer fundamentals, polymerization reactions and polymer processing in supercritical carbon dioxide. The book covers topics in a multidisciplinary approach starting from polymer chemistry and thermodynamics, going through monitoring, polymerization processes and ending with polymer