Hydrothermal and Supercritical Water Processes, Vol 5. Supercritical Fluid Science and Technology

Description: Hydrothermal and Supercritical Water Processes presents an overview on the properties and applications of water at elevated temperatures and pressures. It combines fundamentals with production process aspects. Water is an extraordinary substance. At elevated temperatures (and pressures) its properties change dramatically due to the modifications of the molecular structure of bulk water that varies from a stable three-dimensional network, formed by hydrogen bonds at low and moderate temperatures, to an assembly of separated polar water molecules at high and supercritical temperatures. With varying pressure and temperature, water is turned from a solvent for ionic species to a solvent for polar and non-polar substances. This variability and an enhanced reactivity of water have led to many practical applications and to even more research activities, related to such areas as energy transfer, extraction of functional molecules, unique chemical reactions, biomass conversion and fuel materials processing, destruction of dangerous compounds and recycling of useful ones, growth of monolithic crystals, and preparation of metallic nanoparticles.

This book provides an introduction into the wide range of activities that are possible in aqueous mixtures. It is organized to facilitate understanding of the main features, outlines the main applications, and gives access to further information

- Summarizes fundamental properties of water for engineering applications
- Compares process and reactor designs
- Evaluates processes from thermodynamic, economic, and social impact viewpoints

Contents:
1. Introduction
2. Properties of pure water
3. Properties of mixtures with water
4. Heat transfer
5. Reactions in hydrothermal and supercritical water
6. Extraction processes
7. Processing of fuel materials with hydrothermal and supercritical water
8. Processing of biomass with hydrothermal and supercritical water
9. Synthetic polymers recycling
10. Oxidation in high-temperature and supercritical water
11. Hydrothermal processes
12. Corrosion in high-temperature and supercritical water
13. Process components and processes

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