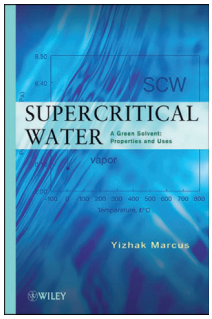

Supercritical Water
A Green Solvent: Properties and Uses. Edited by Yizhak Marcus. John Wiley & Sons, Hoboken, 2012. 218 pp., hardcover, €95.90.—ISBN 978-0470889473

Supercritical Water

Chemical reactions in the liquid phase normally require a reaction medium that has physical and chemical properties that decisively influence or even catalyze the conversions of the reagents. The amount of research and development in the area of near- and supercritical liquids, in particular in water, has thus effectively exploded over the last three decades. This development was among others initiated by basic scientific work by E. U. Frank in the 1960s. Based on quantitative high-pressure measurements, his research group was able to show that the properties of water could be modified substantially by variation of temperature and pressure. The conditions for chemical reactions could thus be adjusted without substituting the "green solvent" water with alternatives.

The author of this volume has now summarized the knowledge gained over decades about this medium in a book. It is divided into five chapters, beginning with an introduction into the physical and chemical basis of mixed-phase thermodynamics, with particular consideration given to near- and supercritical water. There is a comprehensive reference list at the end of each chapter.

Chapter 2 deals with the macroscopic properties of water, such as pVT behavior, heat capacity, heat of evaporation, entropy, dielectric constants, speed of sound, dissociation constants, and much more, and also the transport properties, such as viscosity, self-diffusion coefficient, and thermal conductivity. The data are clearly presented and commented in tables and also in the form of approximation equations.

Chapter 3 presents the current knowledge on the structure and dynamics of water molecules. Various analytical methods, such as scattering (electron, X-ray, neutron), spectroscopic methods (IR, Raman, NMR), and also knowledge accrued from simulations on the structure and dynamics of water are presented in great detail.

Chapter 4 deals with the dissolution potential of near- and supercritical water for gases, organic compounds, and electrolytes. Additives such as electrolytes can often dramatically influence the properties of water in a manner similar to pressure and temperature. Tables, diagrams, and correlation functions also deliver important information here.

The concluding Chapter 5 is devoted to practical applications. The use of near- and supercritical water is demonstrated by numerous practical examples. Examples are:

- Conversion of biomass into fuels
- Oxidation of pollutants
- Organic syntheses with supercritical water as the reaction medium and H_2O as a reagent
- Formation of nanoparticles

The aim of the author, which is to summarize the properties of water over a wide temperature and pressure range and awaken the reader's interest in chemistry in near- and supercritical water, has been achieved with great success. The data is clearly presented in a scientific manner that prevents any ambiguity. This book is a "must-have" for anybody who wishes to have a clear introduction and quickly gain a good overview of this subject.

G. Herbert Vogel
Ernst-Berl-Institut für Technische und Makromolekulare Chemie
Technische Universität Darmstadt (Germany)

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