CRC Handbook of Phase Equilibria and Thermodynamic Data of Copolymer Solutions

By Christien Wohlfarth, CRC Press, Boca Raton, FL. 1st ed. 2010, 551 pp., $250

Understanding the physical properties of copolymer solutions at macromolecular level is important for academic and industrial researchers working in fields ranging from plastics industry to biotechnology. In this regards, the data book "*CRC Handbook of Phase Equilibria and Thermodynamic Data of Copolymer Solutions*" provides vital information covering over 450 copolymers and 130 solvents. The well-organized data source presented in this book aims to reduce the difficulty in gathering information through laborious search of original articles for researchers and engineers working in this field.

The author, Dr. Christian Wohlfarth, is an associate professor in physical chemistry at Martin Luther University Halle-Wittenberg, Germany. He has been working in the field of thermophysical properties of polymer and copolymer systems since 1974 and has published more than 100 journal publications. Dr. Wohlfarth has also published seven books in the area of thermodynamics of polymer and copolymer systems. Among them is the "CRC Handbook of Thermodynamic Data of Copolymer Solutions" published in 2001, which includes data from more than 300 literature sources. In the current book, the author has updated the data source with an additional 500 articles that have been published in the last decade.

The book is presented in two parts covering the phase equilibria and the thermodynamic properties of copolymer solutions. The first part which covers phase equilibria data of copolymer solutions is in the first three chapters of the book. In chapter 1, vapor–liquid equilibrium (VLE) and gas solubility data of copolymer solutions, measured by absolute vapor pressure measurement, differential vapor pressure measurement, isopiestic sorption/desorption methods, inverse or headspace gas chromatography or vapor-pressure osmometry are presented. In chapter 2, liquid-liquid equilibrium (LLE) data of copolymer solutions, cloud-point and/or coexistence data of quansibinary, quansiternary and quansiquaternary solutions of copolymer systems, obtained from continuous thermodynamics and lower/upper critical points of copolymer solutions are presented. Furthermore in chapter 3, high-pressure fluid phase equilibrium (HPPE) data of copolymer solutions are reported. The data in this section were obtained from copolymer systems in supercritical fluids (such as solutions of supercritical CO_2 or multiple monomers).

The second part of this book includes thermodynamic data of copolymer solutions that is further subdivided in three chapters. In chapter 4, enthalpy changes for copolymer solutions and the enthalpy of mixing of copolymer systems at finite and infinite dilution, as measured either by microcalorimerty or by inverse gas-liquid chromatography are presented. In chapter 5, pressure-volume-temperature (PVT) data of copolymers and their solutions, the PVT behavior of copolymers above the melting transition (in a semicrystalline system) or glass transition (in an amorphous system) are covered. Finally in chapter 6, the second virial coefficients (A_2) of copolymer solutions, the data of second virial coefficient of copolymer systems, as measured by colligative properties, scattering methods, sedimentation velocity and sedimentation equilibrium are presented.

The data presented in this book are adapted from standard references only if they are available in numerical form in the original references. However, if the original data are available in a graphical form such as phase diagrams, they are summarized and referred in a tabular format at the end of the chapter. The list of symbols is well documented at the end of the first chapter. The book presents the data in an easily accessible manner. For example, data related to copolymers are well organized in an alphabetical order with respect to the first polymer. Apart from thermodynamic and phase equilibrium properties, author also provided basic information about the copolymers such as molecular weight, degree of crystallization, mass ratio, and supplier information. Additionally, the appendices are well organized with respect to copolymers and solvents. The book is up-to-date covering current references including books, journal articles and dissertations published before December, 2009.

Since the gathered data are from more than one technique, the separation of data in terms of the applied technique would help the reader to better understand the reliability of data based on limitations and advantages of the technique used. Also although, the book has covered a wide range of copolymer and solvent systems, thermodynamic data of solution of copolymers based on polycondensation polymerization such as polyamides, polyesters and polyurethanes are missing. Despite these minor limitations, the book is a thorough data handbook.

Overall, this book provides high-quality phase equilibria and thermodynamic data of copolymer solutions in a very succinct and simple way. Therefore, this book promises to be an important reference handbook for researchers, specialists and engineers related to the field of physical chemistry, materials science and chemical engineering.

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