

Making Flory-Huggins Practical: Thermodynamics of Polymer Containing Mixtures

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The lecture demonstrates how the original Flory-Huggins theory can be extended to describe the thermodynamic behavior of polymer containing mixtures quantitatively. This progress is achieved by accounting for two features of macromolecules, which the original approach ignores. These are the effects of chain connectivity in the case of dilute solutions and the ability of polymer coils to change their spatial extension in response to alterations in their molecular environment. In the general case this approach leads to composition dependent interaction parameters, which can for most binary systems be described by means of two physically meaningful parameters; systems involving strongly interacting components, for instance via hydrogen bonds, may require up to four parameters. The general applicability of these equations is illustrated by many examples for binary systems (polymer solutions and polymer blends), and includes ternary mixtures; it covers linear and branched homopolymers as well as random and block copolymers plus solutions of polyelectrolytes. Particular emphasis is being laid on the modeling of hitherto incomprehensible experimental observations reported in the literature, like islands of immiscibility for solutions of a compatible blend in a common solvent, which is favorable for both polymers.

[1] B.A. Wolf: "Making Flory-Huggins practical: Thermodynamics of polymer containing mixtures"; in *Advances in Polymer Science* 238 (2011) pp. 1-66. "Thermodynamics of Liquid Polymer-Containing Mixtures", Springer Verlag Berlin Heidelberg Editors: S. Enders and B.A. Wolf