

Monomer Partitioning in Emulsion Copolymerization

Jenci Kurja and Anton L. German

Eindhoven Polymer Laboratories, Eindhoven University of Technology

P.O. Box 513, 5600 MB Eindhoven, The Netherlands.

Due to the intrinsic heterogeneity of an emulsion polymerization the kinetics and mechanisms which control this polymerization are difficult to describe. In order to get more insight in the kinetic processes involved in an emulsion (co)polymerization a detailed knowledge of the partitioning of monomer(s) over the different phases present is necessary. The monomer concentration in the latex particles directly determines the rate of polymerization while the monomer ratio in the latex particles determines the chemical composition of the polymer formed. Therefore, an accurate knowledge of the concentration of the monomer in the different phases of the polymerization system is necessary to develop and test kinetic models for the emulsion polymerization process. These models can be useful in the design of polymerization reactors, process control and product characteristics such as molecular weight and chemical composition distributions of the polymers formed. In this lecture a thermodynamic model based on the Flory-Huggins theory of polymer solutions will be discussed and applied to experimental results on the partitioning of monomer(s) over the different phases present during an emulsion (co)polymerization.

During the lecture special attention will be paid to the practical application of the thermodynamic model. In doing so, several systems will be discussed in somewhat more detail, such as the swelling behavior of styrene-acrylonitrile copolymer latex particles and systems containing water miscible monomers.