71a Prediction of Flow and Size Distribution in Emulsion Polymerization Processes

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Emulsion polymerization is an important process in the production of latex paints and synthetic rubber. Insight into how factors such as operating conditions and transport phenomena affect the quality of the final product in an emulsion polymerization process can be gained by through computational fluid dynamics (CFD) simulation of the process in conjunction with the solution of population balance equations for the particle size distribution of the polymer. To demonstrate this approach, a simplified, computationally efficient model for particle size distribution (PSD) [1] was implemented and validated against data for production of styrene particles with persulfate initiator. The suitability of the simplified model for use together with CFD calculations is evaluated through comparison of results from a combined solution of the flow and population balance equations with data for stryrene production in a continuous stirred tank reactor.

[1] Prescott, S.W., Fellows, C.M. and Gilbert, R.G., 2002, “Maximum achievable particle size in emulsion polymerization: Modeling of large particle sizes”, Macromol. Theory Simul., vol. 11, pp. 163-170.