CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : Manufacture Française des Pneumatiques MICHELIN
Ecole Nationale Supérieure de Chimie de Clermont-Ferrand
Institut de Chimie de Clermont-Ferrand (ICCF UMR 6296)
U.F.R. S.T. Département de Chimie

Jeudi 2 avril 2015 à 16 h

Amphi Rémy (Campus des Cézeaux)

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HIGH SOLID CONTENT LATEX SYSTEMS: PARTICLE STABILISATION AND ISSUES RELATED TO PROCESS SCALE---UP

This work focuses on the application of a computational framework to examine the scale-up of a semi-batch emulsion polymerization process used to produce high solid latex formulations based on bimodal particle size distributions.

In the where we wish to create a second population of small particles in a concentrated latex of larger ones, different feed policies can be used: shots of initiator+surfactant, or the gradual feeding on both. In the first case, the inability of the reactor to instantaneously disperse the reactants results in a concentration gradient, with the concentration of surfactant and initiator being highest in the feed zone has two effects. The first effect is a high local micelle concentration, leading to an increased rate of micellar nucleation near the feed zone. The second effect is an increase in the local ionic strength which affects particle stability and thus the rate of particle coagulation. The localized concentration gradients during this short nucleation phase will have a large impact on the PSD of the final product.

The commercialization phase for most production processes involves scaling-up the process over a series of increasingly larger vessel scales, adjusting process conditions to maintain a consistent product quality at each successive scale. There are a number of classical heuristic techniques available to guide production engineers in the scale-up process, but these heuristics were developed for fluids with constant viscosity and under the assumption that the flow inside the reactor remains either fully laminar or fully turbulent during scale-up. However the development of population balance models based on an understanding of how particles are generated and stablised, coupled with commercial computational fluid dynamics software offers us an opportunity to perform scale-up operations in a much more detailed and cost-effective manner.

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