

Chemical Engineering Aspects of Producing Polymer Colloids

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Abstract

Polymer colloids can be made by a variety of techniques including emulsion polymerisation, miniemulsion polymerisation, suspension polymerisation and phase inversion. When these operations are carried out on a large scale, it is necessary to consider process variables which may be neglected in some laboratory experiments.

With emulsion polymerisation, the choice of reactor type has a significant effect on the distribution of both particle age and particle size. Realistic models are required for each reactor type (e.g. batch, semi-batch and continuous-flow) because product characteristics depend on the type of reactor which is used.

In suspension polymerisation reactors, monomer drops must be formed and stabilised effectively. Surface stabilisers should limit drop coalescence and reactor design must ensure that turbulence is uniform. In some cases, the time taken to achieve a stable drop size distribution is a significant fraction of the total reaction time. One consequence of restricted coalescence is poor mixing between the drops. Very small drops are required for colloid production and consideration must be given to agitation intensity and to the use of co-surfactants.

With polymerisation on an industrial scale, attention must be given to effective heat transfer, mixing between drops of the discontinuous phase, particle coagulation at high solids content and monomer recovery.

Polymer colloids can be produced by phase inversion without using large amounts of surfactant. Here, it is necessary to have good control of agitation conditions, phase ratio and temperature.