

MASS TRANSFER AND AGITATION IN THE EMULSION OF PVDF

Mariana Torres Aladro, CP2M UMR 5128, Université de Lyon, Villeurbanne, France
mariana-guadalupe.torres-aladro@etu.univ-lyon1.fr
Estela Gelinski, CP2M UMR 5128, Université de Lyon, Villeurbanne, France
Nida Shiebat Othman, LAGEPP UMR 5007, Université de Lyon, Villeurbanne,
Timothy F.L. McKenna, CP2M UMR 5128, Université de Lyon, Villeurbanne, France

Key Words: Emulsion Polymerization, Vinylidene Fluoride, Mass Transfer, Agitation.

The emulsion polymerization of vinylidene fluoride is an interesting case study for a number of reasons. First of all the monomer is supercritical at the temperature and pressure of polymerisation, and secondly the design of the agitation system is of the utmost importance in controlling the rate of polymerisation and the molecular weight distribution, and finally because the use of chain transfer agents is complicated because the rate of polymerisation is also sensitive to the CTA concentration (decreasing as the CTA concentration increases).

The objective of this project was to take an industrial recipe run at 30 % (w/w) solids and to increase the solid content ~ 55% (w/w%). This literature review shows that to date, no one has reported a process that allows one to achieve this goal. Furthermore, it is important for us to understand the impact of agitation, in particular with regards to how it effects particle stability and how it controls mass transfer in the reactor. The conception of the agitator used in the reactor was modified in parallel as we learned more about the sensitivity of the polymerisation rate to mass transfer, and how the latter was effected by impeller design.

Experiments were carried out on a 4L pilot plant under industrial conditions (~80 bars and ~80°C). At the same time we also proposed a simplified model that incorporates mass transfer coefficients to explain the experimentally observed phenomena.

The outcome of this study ultimately led to the design and construction of an new, improved pilot plant.