

MASS TRANSFER PHENOMENA IN VINYLIDENE FLUORIDE EMULSION POLYMERIZATION

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In order to contribute to a better understanding of vinylidene fluoride (VDF) emulsion polymerization, an experimental study under temperature and pressure conditions similar to those encountered in industrial processes was carried out. It is shown that the initial rate of polymerization is not influenced by the agitation of the reactor, but that after a limited time, the reaction rate increased with the rate of agitation. In addition, the use of a more efficient turbine also increases the rate of polymerization. It is proposed that this is due to the limitations of mass transfer. This idea is confirmed by a similar dependence of the average molecular weight on stirring.

In the experiments presented in this work, all particles are generated by homogeneous coagulative nucleation since the amount of surfactant used is less than the CMC. The first step in this process is the growth and precipitation of trace radicals/chains dissolved in water. The growth rate is a direct function of the availability of the monomer in the aqueous phase, which in turn will depend on the pressure, temperature and solubility of the monomer, as well as the rate of stirring. The results show that the stirring rate has a strong impact on the initial rate of polymerization, and on the ability to control the temperature of the reactor. It has been shown that stirring conditions that lead to a high gas-liquid mass transfer coefficient also lead to higher polymerization rates, and higher average molecular weights. This is most likely due to greater availability of the monomer for the particle nucleation process, and possibly the propagation step in the polymer particles.