

Application of a Hydrodynamic Model to Microencapsulation by Coacervation

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Abstract:

The role of the hydrodynamic conditions in determining the characteristics of microcapsules made by coacervation was investigated in this study. The model proposed by Armenante and Kirwan, regarding the mass transfer to microcapsules in a turbulent agitated system, was applied. The working hypothesis was that the microcapsules are formed in microeddies generated by the agitation source. The dimensions of the microeddies, calculated in the vicinity of the agitation source according to Armenante and Kirwan, depend on the physical properties of the liquid medium and are inversely proportional to the power exchanged from the agitation source of the system. The power was determined according to the hydrodynamic rules developed by Rushton et al. The experimental results confirmed the hypothesis of the model. Indeed, a good relationship was found between the calculated size of the microeddies and the measured diameter of the microcapsules. Moreover, the distribution error (the standard deviation of the microcapsule size frequency distribution curve) was found to be proportional to the mean diameter value of the microcapsules and microeddies. This can be explained considering that the microeddies diameter increases by moving away from the agitation source and, consequently, a distribution of microeddies of difference sizes is present in the medium. The distribution error, which represents the difference between the smaller and the larger diameters, is inversely proportional to the exchanged power and, consequently, proportional to the mean diameter.

Keywords:

Microencapsulation, Coacervation, Hydrodynamics, Agitation System, Exchanged Power