Simulations of mother liquor and crystal suspension flows in baffled stirred tank crystallizer

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The industrial crystallization is commonly carried out in baffled stirred tanks. Depending on rheological nature of mother liquor, the suspension mixedness and flow patterns of fluid and particles can vary significantly. Several factors can affect the quality of solid-liquid mixing, including tank geometry, impeller geometry and speed, baffles, density, and rheological properties. Thus, mixing conditions usually affect crystallization, especially with higher mixing intensity, high thick suspensions, and long residence times crystals may break due to secondary nucleation. Changing the mixing conditions in a crystallizer can directly impact the kinetics of the crystallization process and the final crystal size.

Many mixing characteristics such as the average energy dissipation, crystal collision energy, and power number required for mass transfer rate calculation can be calculated using a VisiMix software. In addition to process optimization, it is possible to make process up-scaling simulations. The present work studied the scaling-up process of erythritol and xylitol batch cooling crystallization from 40 °C to 20 °C in terms of constant tip speed and energy of dissipation. Xylitol is very soluble in water, and saturated xylitol solutions usually have relatively high viscosities, while saturated erythritol solutions are not viscous. In addition, the mixedness of the suspension in the batch cooling crystallization in the beginning of the nucleation process and in the end of crystallization was compared.

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