Comparison of One Dimensional and Two Dimensional Population Balance Model for Optimization of a Crystallization Process

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Abstract

In this work, the advantage of two-dimensional population balance modeling (2D PBM) for a needle-shaped API is highlighted by comparing the one-dimensional population balance model (1D PBM) developed for an antisolvent crystallization with the 2D PBM. The API utilized for this work had extremely slow desupersaturation, and was not able to achieve solubility concentration despite a ~50 h seed bed age. While the 1D PBM is useful in optimizing the crystallization process to enhance desupersaturation, it is unable to match the particle size quantiles well. 2D PBM was necessary to probe the impact of crystallization process parameters on particle aspect ratio (AR). Simulations utilizing the 2D PBM indicated that regardless of antisolvent addition rate or seed morphology, the final material would still be high aspect ratio. This knowledge saved the investment of much time and efforts in trying to minimize particle AR with changes in crystallization processing parameters alone.

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