Rigourous Mathematical Modeling of Cooling Crystallization in Couette-Taylor Crystallizer with Dynamic MZW Model

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Couette-Taylor reactor (CTR) has been generally used in the field of fluid mechanics because of its intrinsic characteristics. By applying CTR to crystallization process, it is expected to reduce breakage of crystals and induce well-mixing between solution and crystals. In order to model the crystallization process in CTR, various phenomena should be considered. One of them is meta-stable state of solution. Meta-stable state is an imaginary state in which no nuclei are formed but only crystals grow.

In the present work, it is aimed to develop a theoretical model of crystallization process in CTR with MZW model in order to use robustly in various operating conditions and also precisely predict the crystallization process. The fluid characteristics in the CTR are observed from characteristic analysis of fluid dynamics by CFD (Comsol Multiphysics) as well as experiments. For the model validation and parameter estimation, the experiments are conducted under various operating conditions. Using the developed model, the optimal operating condition can be found, and then productivity and product quality can be enhanced.