Non-isothermal Taylor vortex for uniform crystal size distribution in cooling crystallization

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This work presents a systematic study for obtaining narrow crystal size distribution (CSD) by non-isothermal Taylor vortex in seeded batch cooling crystallization. The proposed non-isothermal Taylor vortex was controlled by the independent temperature of rotated inner and static outer cylinders in Couette-Taylor (CT) crystallizer. The CSD is formulated by simultaneous dissolution or re-crystallization with series of decision variables, including rotation speed, non-isothermal value, non-isothermal modes and equilibrium temperature. The results indicate that the higher rotation speed promote optimal CSD due to the effective heat transfer for dissolution of fine crystals and growth of survived crystals. Importantly, the crystal dissolution and growth for narrower CSD is tuned by the non-isothermal value in a certain range, otherwise the secondary nucleation generates contributing to the generation of broader CSD and smaller crystals. Furthermore, the relative narrow CSD can be obtained even at short batch time in all experiments. From the experimental results, it was demonstrated that the non-isothermal Taylor vortex is a fashionable and highly efficient approach for CSD control in seeded batch cooling crystallization.