

Crystal growth and nucleation kinetics estimation from an unseeded crystallization equation

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An equation which is developed for unseeded crystallization without aggregation and breakage is applied to estimation of crystal growth and nucleation kinetics. By solving the conservation of mass and the growth kinetic of particles, the equations about the average size of particles can be derived as a function of time. From the conservation of mass, the nucleation kinetics is dependent of both growth kinetics and the supersaturation.

Total mass and average size of crystals with particle synthesis experiments as a function of time are measured. Nucleation and growth kinetics, induction time and size of nucleus can be estimated by comparing experimental results with numerical solutions of the equation, without solving population balance equation and acquiring crystal size distribution data. The equation can be applied to any unseeded crystallization processes, regardless of types of materials such as ionic, organic, and metallic particle.