



Review paper

Supersaturation operation for quality control of crystalline particles in solution crystallization

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ABSTRACT

The crystallization is widely used in chemical processes, and is one of unit operation which deals with crystallization phenomena. The purposes of crystallization are to separate desired component and to produce crystalline particles. However, phenomena of crystallization are not simple and the relationships between operation conditions and product specification are complicated. The driving force of crystallization is supersaturation in non-equilibrium process. So the operation strategy for designing supersaturation is important in order to keep high quality such as size distribution, crystal morphology and polymorph. In this paper, the relationships between supersaturation and crystal qualities are discussed, and the operation design methods are introduced to control crystal qualities in solution crystallization.

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1. Introduction

Crystallization is widely used in various chemical industries such as pharmaceuticals and the food science field. Crystallization is unit operation with the non-equilibrium crystallization phenomenon of which driving force is supersaturation. A crystal is the solid form which the molecule and the ion arranged orderly, and crystallization is used not only as separation but as purification operation from that unique property. Since crystals can be manufactured as particles in the case of solution suspended crystallization,

crystallization also has properties as crystalline particles manufacturing operations. Thus, crystallization operation is the method to realize “separation and purification” and “crystalline particles production.” However, demand to crystalline qualities has been getting severe recently. The strategy of operation design to manufacture the crystalline particles with high quality (particle size distribution, crystalline form, crystal polymorphism, etc.) is important.

It is necessary to generate supersaturation in order to carry out crystallization. And nucleation and growth occur with the driving force of supersaturation. When crystalline particles are manufactured, particle size distribution is determined in the suspended

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