FUNDAMENTAL STUDY FOR DESIGN OF OPTIMUM CONDITIONS CRYSTALLIZER AND OPERATION FOR SODIUM CHLORIDE CRYSTAL

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The theory of industrial crystallization has been rapidly developed, recently and makes clear crystallization in chemical plants which is not turned out by scientific crystallization theory. This research project was started to make crystallization technique of sodium chloride developed on industrial crystallization theory. The recent studies of these theories were discussed on initial step of this project, and crystallization of sodium chloride and fundamental researches for development of industrial crystallizers and operations were studied on industrial crystallization theory. A method for development of a new crystallization technique of sodium chloride was proposed. The outline of them are summarized as followings;

The first chapter discusses on the correlation between this research project and industrial crystallization theory for understanding of back ground of this project, and industrial crystallization theory is summarized in the second chapter.

The third chapter studies on the correlation between a concentration and a density of aqueous solution of sodium chloride. The correlation proposes a convenient method for determination of saturated concentration of an aqueous solution of sodium chloride.

In the fourth and fifth chapters, crystal growth of sodium chloride are studied by observation of stationary fluidized seed in supersaturated solution.

On tests of fluidized seed, suspended crystals are considered not to be affected one another by the reason of a few suspended crystals. Crystal growth mechanism is discussed on the two steps of diffusion and surface reaction and crystal growth rate is proposed to be estimated from the rate of both different steps. In the six chapter, nucleation and crystal growth rates of sodium chloride are experimentally studied in three well stirred vessels of different size in which an agitator of different material is used. In this study, a few crystals are suspended on which suspended seed are supposed not to affect nucleation contacted by one another.

In the seventh chapter, a semi-batch crystallizer which seed crystal is suspended on batchwise in and supersaturated solution with a constant concentration is continuously passed through, is set up and secondary nucleation rate by and crystal growth rate of suspended sodium chloride crystals are observed under high density of suspended crystal almost same to those in industrial crystallizers. These rates are much different from those obtained by a few suspended seed. They are supposed to be come from effect of high suspension density, and almost same to those in industrial crystallization.

In the eighth chapter, continuous crystallizers for sodium chloride are operated, and crystallization rate and crystal size distribution are observed on steady state operations. From these data, operating points shown by productivity and crystal size are plotted in a design chart and are compared with those from industrial crystallizers. From these discussions, crystal size and productivities of industrial plants might be concluded to be estimated from laboratory data. And new development methods for design of continuous crystallizers and their operating conditions were proposed in the ninth chapter.

The research project's results are summarized to be applied for development of general continuous crystallization technique not only for crystallization of sodium chloride in the tenth chapter.