In-situ observation of a growing crystal of sodium chloride in the presence of small crystals in suspension

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Summary

Growth behavior of sodium chloride crystal mounted in a flow cell was observed under microscope by an in-situ technique. First, growth behavior was observed in a pure solution , in which no small crystals were present. The crystal grew, forming a very smooth surface. On the other hand, when a solution suspending small crystals, which were primary nuclei or secondary nuclei, small crystals were some times observed to be sticking on the growing surface. The growth rate showed a tendency to be decreased compared to the rate in the case of pure solution. This is the reverse of literature data and looks peculiar. But the reason could not be clarified in this study. Small sticking crystals was not observed to be aligned in one direction. According to previous studies in our laboratory, small crystals in suspension are sticking to the growing (large) crystals in a fluidized bed crystallizer. These small crystal looked to be aligned in a direction same as those of the large growing crystals. The behavior of the sticking small crystals are thought to be important problem in relation to the growth mechanism of sodium chloride crystals in suspension. In this study, any decisive conclusion could not be deduced, because of small number of sticking event observations. This is a research topics to be solved. Apart from the above in-situ observations, developments of the crystal size distribution of small crystals suspended in a stirred vessel were measured by using an Elzone Particle Counter. Although nuclei continued to be produced during the run, the number of crystals was shown to reach a maximum value due to agglomeration. A population balance model was devised, which theoretically explained the fact that the size distribution development was largely affected by agglomeration. The agglomeration rate was found to increase in proportion with the over-all number of crystals to the second power.