

# Development of High Efficiency Salt Crystal Production Method in Evaporative Crystallization with Improvement of Production Rate and Crystalline Qualities

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## Summary

**Introduction** The salt production system attracts attention from a viewpoint of the salt removal from the concentration sea water in the seawater desalination process. Efficient operation is required in order to operate the system at low cost. It is necessary to enhance the growth rate for realization of effective production. The growth enhancement phenomenon by microcrystals has been reported. In this phenomenon, control of the number of microcrystals is important. Excessive generation of microcrystal worsen crystal size distribution and productivity. To eliminate excessive microcrystals, addition of dissolution water is effective. The purpose of this present study is to develop the new method that can enhance the crystal growth rate under high suspension solution with consideration on crystal size distribution.

**Results and Discussion** Addition of low boiling point components was taken into consideration for generation of microcrystals. Low boiling point component act on microcrystal generation as an anti-solvent. According to the analysis of change in mean crystal size, the growth rate was enhanced by adding the anti-solvent as expected. However,  $CV$  value has improved immediately after addition of anti-solvent as an interesting phenomenon. It became clear that the operating condition which growth rate enhancement and crystal size distribution improvement can realize simultaneously exists. Change of solution concentration after anti-solvent addition was considered by using ternary phase diagram. As a result, when the anti-solvent evaporated, the solution became undersaturation temporarily, and the micro crystals were dissolved.

**Conclusion** The micro crystals which were generated by addition of low boiling point component enhanced crystal growth rate. On the other hand, excessive microcrystals were dissolved after evaporation of anti-solvent. This new method could improve crystal size distribution. The production method with high efficiency could be developed by addition of anti-solvent to evaporative crystallization.