

Production of pure sodium chloride crystals
Crystallization phenomena of sodium chloride by antisolvent crystallization
under the influence of potassium chloride impurities

Prof. Izumi Hirasawa, Dep. of applied chemistry, Waseda Univ.

Shogo Kaneko (D1), Dep. of applied chemistry, Waseda Univ.

Yasuhiro Yamagami (M1), Dep. of applied chemistry, Waseda Univ.

Summary

The antisolvent crystallization of sodium chloride crystals was carried out under the influence of potassium chloride, to investigate the effect of impurities to the antisolvent crystallization phenomena of sodium chloride. Sodium chloride-potassium chloride-ethanol-water solution was prepared into the a crystallizer. The Na/K ratio and the initial ethanol volumetric ratio of that starting solution were predetermined. Ethanol was added as antisolvent near the agitator in the crystallizer by using micro pipette in an instant. Each operation was performed for 15min., and after the operation, produced crystals were observed with optical microscope or SEM. The concentration of potassium ion included in produced crystals was also determined by the atomic absorption analysis.

Obtained crystals on some operational conditions were found to be unagglomerated and monodispersed. Pure sodium chloride crystals was obtained when Na/K ratio in starting solution was 6, 10 or 14, and potassium chloride crystals or potassium chloride and sodium chloride mixed crystals were obtained when Na/K ratio was 2. The crystals produced in case of Na/K=10 seemed to have smooth surface, however, crystals produced in case of Na/K=14 seem to have hollowed surface. The reason of this difference was considered that the potassium ion restrained the crystal growth and consequently modified the crystal surface.

The relationship between the concentration of potassium ion in the product crystals and operational conditions was investigated by the atomic absorption analysis. As the result, the larger initial potassium chloride concentration was, the more potassium ion was included. It was considered that the inclusion of mother liquor was occurred. In addition, the larger volume of ethanol was fed, the more potassium ion was included. The reason of this was considered that large supersaturation produced by a large amount of ethanol caused the crystal growth rate to increase, and large growth rate caused more inclusion of mother liquor.