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Development of Morphology Control for Aggregated Particles of Mg and Ca Compounds in Each Application

Yoshiyuki Shirakawa, Toru Ishiba

Department of Chemical Engineering and Materials Science,
Doshisha University

Summary

A large amount of bittern discharged in the salt production process contains a lot of unused resources. If it is possible to find a manufacturing process of a material that uses a particularly high concentration magnesium and calcium, it can realize low cost resource securing and reduction of environmental loads. In this study, we will study the advancement of the method of synthesizing layered double hydroxide (LDH) from calcium and magnesium remaining in de-K bittern, and a technology for morphology control of primary particles and aggregated particles for the application. It can be expected to improve the handling properties and to enhance the functionality such as anion exchange capacity.

In the synthesis of hydrotalcite (HT) of LDH, a mixed solution containing Mg and Al and de-K simulated bittern were dropped using a microsyringe into a three-necked round bottom flask containing mother liquor, and simultaneously sodium hydroxide aqueous solution for pH adjustment. After dripping and precipitation, solid-liquid separation was conducted after an appropriate aging time to obtain HT samples. Hydrocalumite consisting of Ca and Al is another LDH and was also synthesized by the same process of the HT. The structures, ion concentration and anion exchange property of HT and HC were analyzed by SEM, XRD and ICP.

The precipitated particles from the bittern was preferentially Mg-type hydrotalcite as results of the XRD measurements. The synthesis of Ca-type hydrocalumite can be also performed from the solution excluded the hydrotalcite at another higher pH region. All LDHs had chloride ions as charged intercalants for keeping charge neutrality in the layer structures. The anion exchange property was investigated between Cl^- and HPO_4^{2-}. The exchange structures were checked by interlayer distance variation before and after the exchange operation. The anion exchange capacity of the hydrotalcite and hydrocalumite from the bittern showed lower than that from the reagents without impurity cations prepared in stoichiometric concentrations. A recovery process of Mg and Ca ions from the bittern was proposed with a mass production method in this paper.