

Development of Crystallization Technology for Magnesium Resource Recovery from Integrated Process of Salt Production and Seawater Desalination

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Summary

Introduction If sea water desalination process is integrated with a resource recovery process, a reduction in environmental load and production of valuable resources can be achieved. Mg^{2+} ion is the second most abundant ion in sea water. However, the development of Mg^{2+} ion recovery method is not sufficient. The Mg^{2+} recovering method in magnesium hydroxide (MH) form from brine has been studied. Brine and bittern are produced when the sea water desalination process is integrated with the resource recovery process. When MH is recovered from concentrated sea water, two kinds of raw resource materials brine and bittern can be considered. However, the MH recovery process using brine as a raw resource material is not compared with the recovery process using bittern. This is because there is almost no fundamental data of MH crystals for process comparison, and MH crystals are produced as ultra-fine particles. Therefore, the purpose of this study is to propose the fundamental data for development of the MH recovery process in an integrated process. In particular, the prevention method of fine MH crystal deposition is investigated, and the yield and crystallinity of MH crystals are compared from crystallization technology aspects.

Results and Discussion From the result of comparison of the two kinds of CH addition methods into concentrated sea water, the CH tablet addition method prevents precipitation of fine MH crystals. From the results of comparison between brine and bittern as the raw resource material, it was clear that the yield and crystallinity of MH crystals were strongly dependent on temperature and the raw resource material. Under the low temperature condition, brine should be used as a raw resource material in order to obtain MH crystals. Under the high temperature condition, there are two candidates in priority order. When MH yield has high priority, brine should be used as the raw resource material. On the other hand, bittern should be used when priority is given to MH crystallinity.

Conclusion The production method of MH crystals with high yield and crystallinity has been proposed. It is clear that the yield and crystallinity of MH crystals are strongly dependent on temperature and the kind of raw resource material. These results show a strategy for improvement in process efficiency when MH crystals are recovered from the sea water desalination process.