

Basic Study on Recovery of Boron from Seawater with Novel Chitosan Resin

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Summary

This study aims to develop an environmentally-friendly resin for boron recovery and to establish a selective adsorption system of boron using the resin. Chitosan resins modified by various saccharides (galactose (GalMC), glucose (GluMC) and mannose (MMC)) were prepared in anticipation of the interaction between borate and the hydroxyl groups of the saccharides. The adsorption characteristics of boron and germanium on the chitosan resins were quantitatively investigated for the purpose of the removal of boron from a boron mine or the desulfurizing equipment in coal-fired steam power stations and the enrichment of boron from seawater.

The chitosan derivatives containing various saccharides were synthesized by reductive N-alkylation, and the products were crosslinked with ethylene glycol diglycidil ether. Chitosan resins templated with boron or germanium were also synthesized. The adsorption characteristics of boron and germanium on the chitosan resins were investigated and the following information was obtained.

- 1) The adsorption isotherms of boron and germanium correlated well with the Langmuir equation, and the order of the magnitude of the adsorption equilibrium constants and the saturated adsorption capacities of boron and germanium were as follows; $MMC > GalMC > GluMC$.
- 2) The templated resins increased the amounts of boron or germanium adsorbed compared with those of the non-templated resin. However, the selectivity of boron over germanium was not improved. This is considered to be caused by that both the metals have a similar adsorption mechanism in each other. On the other hand, the extent of crosslinking enhanced slightly the selectivity of germanium over boron. In order to obtain a resin with high-selectivity for boron, the introduction of a compound with 1,3- hydroxyl group into chitosan is thought to be one of the promising methods. This subject is now under consideration.