Development of Potassium and Bromide Ions-memorizing Inorganic Ion-exchangers

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Summary

It is difficult to selectively separate and take up small amounts of K^+ ions from seawater in the presence of a large excess of Na^+.

During investigations of the cation-exchange characteristics of inorganic ion-exchangers, we have discovered that K^+ ions in aqueous solution are strongly held on some synthetic fluorine tetrasilicic micas by a cation-exchange reaction at room temperature, i.e., some potassium ion-memorizing inorganic ion-exchangers have been prepared.

From among the successfully synthesized micas, sodium ion-exchanged taeniolite (Na^+T ; $NaMg_2LiSi_4O_{10}F_2 \cdot 2H_2O$) and sodium ion-exchanged hectorite (Na^+H ; $Na^+_{1/3}Mg_{8/3}\ Li_{1/3}Si_4O_{10}F_2 \cdot 2H_2O$) were found to be promising and the removal behavior of K^+ ions from a model aqueous solution and practical seawater to the hopeful sampleswas examined by using normal batch-and-column methods.

It was found that $Na^+ \rightleftarrows K^+$ exchange isotherm on Na^+T rises steeply and attains plateau above the diagonal line in the initial stages, which reveals that K^+ ions are extremely preferred over Na^+ ions in the low-concentration region of K^+ ions. The order of K^+ ion selectivity was to be $Na^+H < Na^+T$ in the low-concentration region of K^+ ions.

Further, the Na^+T was found to selectively take up a regular amount of K^+ ions without depending on the concentrations of Na^+ and K^+ ions in solution.

Taking the results into account we can conclude that Na^+T can be utilized in the separation and uptake of K^+ ions from seawater (K^+ : 380 ppm, Na^+ : 10500 ppm).