

Development of Analytical Method for All Trace Elements in Seawater and Solar Seawater Salt

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Summary

The elements at the concentration range from the major to trace level in natural solar salt, which was dissolved in pure water and 0.1 M nitric acid, were determined by inductively coupled plasma atomic emission spectrometry (ICP-AES) and inductively coupled plasma mass spectrometry (ICP-MS) with and without preconcentration using a Chelex 100 resin. In preconcentration procedure, the elements at the trace concentration level were concentrated by a concentration factor of 50, and at the same time matrix elements (Na, K, Mg, and Ca) were eliminated to reduce matrix effects in ICP-MS analysis. Consequently, 36 elements in natural solar salt were determined in the concentration range from the % level to the pg/g level. The different concentrations were observed for many elements such as Fe, Al, Mn, rare earth elements (REEs) and so forth, when the salt sample was dissolved in pure water and 0.1 M nitric acid. In general, most of the elements determined were at the higher concentration levels in 0.1 M nitric acid than in pure water. The elements determined in the present experiment are classified as follows, depending on their concentration levels on the dry weight basis of salt;

Major element (> 1%) : Na

Minor element (1 ~ 0.01%) : K, Mg, Ca

Trace element (0.01 ~ 0.0001%) : Sr, (Fe), (Mn)

Ultratrace element (< 0.0001%) : All other elements,

where Fe and Mn in the parentheses are the case dissolved in 0.1 M nitric acid.

Furthermore, the relationship between the concentrations of the elements in natural solar salt and seawater was examined to characterize the crystallization process of common salt from seawater produced under solar radiation. The present experimental results suggest that some characteristic partitionings of the elements between seawater and natural solar salt may occur during the crystallization processes.