No. 1408

New Development of Identification and Determination of Aluminum Complex in Seawater: Aluminum- Fluoride Complex

Miho（Tanaka）Takahashi

Tokyo University of Marine Science and Technology

Summary

In order to clarify the solution state of metal ions in seawater, it is important to obtain the information on solution state and abundance of metal ion. However, in the high concentration of salt solution, such as seawater, it should be required to eliminate sodium and calcium ions to extract and determine the target ions. Purpose of this study is the establishment of both identification and determination of aluminum chemical species in solution. It is well known that free aluminum ion (Al^{3+}) shows toxic for aquatic biology, but its toxicology of Al^{3+} with fluoride ion deduces by stability of its complex. In Al^{3+} in solution, the information of abundance of total Al concentration is not enough, but it becomes very important factor to analyze the solution state and abundance of Al^{3+}, we call “speciation analysis”.

Interfaces for Capillary electrophoresis - electrospray ionization mass spectrometry (CE-ESI-MS) and capillary electrophoresis - inductively coupled plasma mass spectrometry (CE-ICP-MS) were self-designed and assembled for the speciation analysis of free aluminum and aluminum fluoride complexes. The aluminum species in solution were separated according to the valence in CE. On CE-ESI-MS analysis, separated aluminum species were identified by *m/z* values. And molecular ion weight and structure of aluminum species were identified by CE-ESI-MS. Low detection limit (0.11 μM), which is suited to achieve the direct determination of aluminum species in natural water, was obtained by using Cool Plasma CE-ICP-MS. As the aluminum species were separated by CE, separated species with 1, 2 and 3 valence were determined by CE-ICP-MS. Based on the results of CE-ESI-MS, aluminum species distributions were calculated, and compared with the results by calculating the theoretical results from stability constants of MINEQL+. Experimentally determined aluminum species distributions showed good agreement with calculated distributions within 15%. However, it was found that aluminum fluoride complexes were partly disintegrated during the separation process of CE. From comparison of these results and other reports, new analytical methods that do not disturb the original species distributions were discussed. Finally we concluded that this new method established in this study make us possible to obtain the information on solution state and abundance of aluminum species in seawater after some points of innovation.