

## Harmful Reagents-free Separation/Concentration of Boron and Arsenic in Environmental Water

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**Keywords:** Harmful Reagent-free; Separation and Concentration method; Eutectics; Boron; Arsenic

Alkali halide aqueous solution forms eutectics of salt and water at low temperature. By keeping the temperature at which only the eutectics of salt and water melted at around 0 to -20 °C, trace elements in water can be concentrated to the eutectic mixture. In the temperature range above the eutectic point and below the melting point of ice, only the eutectic mixture exists as a liquid phase, so it was thought that a new low-temperature separation and concentration method could be constructed. Since the eutectic point depends on the alkali halide, the applicable temperature range is different. In this study we focused on harmful reagents-free freeze concentration method for the purpose of separating and concentrating boron and arsenic in environmental water.

We focused on boron and arsenic which are components of hot springs. Also, environmental standards of boron and arsenic are defined for the protection of human health as environmental standards for water pollution in public water bodies. An aqueous solution was prepared with a boron or arsenic concentration of 0.1 mmol/L as a model solution. In addition, sample was prepared with a NaCl or KCl concentration of 10 mmol/L as a coexisting salt. After freezing 100 mL of the sample at about -30 °C for 12 hours or longer, the frozen sample was melted at room temperature and the aqueous phase was separated every 10 mL. The concentration of boron and arsenic was determined by ICP-AES (Hitachi High-Tech Science SPS3510).

The boron and arsenic were concentrated to 10 mL of early stage of melting more than other liquid phases. It was found that 80 % or more of the total boron or arsenic can be concentrated in the early stage of melting up to 30 mL.