

# Simplified determination method of fluoride ion in volcanic thermal water with an ion selective electrode

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## Introduction

Water chemistry of active crater lakes and volcanic thermal water, especially concentrations of halide ions and sulfur species which are originated from magmatic volatiles, is a good indicator to predict volcanic activity. Among dissolved components, the fluoride ion is unique and notable. Hydrogen fluoride in magmatic volatiles has high reactivity with rocks through their underground pathways.<sup>1)</sup> Thus, fluoride ion is not detected in high concentration in volcanic thermal water at the ground surface when volcanic activity is not high, whereas it can be detected in significant concentration in active periods. For the accurate determination of fluoride ion content in volcanic thermal water, however, distillation treatment, a time-consuming process, is in general indispensable to separate fluoride ion from coexisting components which form complexes with it. In this study, we examined simplified determination methods of fluoride ions without distillation, i. e., those utilizing an ion selective electrode (ISE).

## Experimental

Water of Yugama, an active crater lake of Kusatsu-Shirane volcano, Gunma, Japan, was served as a test sample. To determine the fluoride ion with an ISE in Yugama water without distillation, we examined several agents for masking metal ions which were to be added to a total ionic strength adjustment buffer (TISAB) for the ISE measurement. We tried both the calibration curve method and the Gran' s plot method. The latter is recommended in the literature for determination of fluoride ion by using an ISE in waste water containing aluminum ion.<sup>2)</sup>

## Results and Discussion

The determined values varied depending on the kind of masking reagent added to the TISAB. Among the values, those obtained by using the TISAB containing CDTA (cyclohexanediaminetetraacetic acid)-sodium citrate<sup>3)</sup> or tris(hydroxymethyl)aminomethane-sodium tartrate,<sup>4)</sup> seemed to be reasonable because they were close to the one determined by ion chromatography after pretreatment in which distillation was incorporated according to the Standard Method of Analysis for Mineral Springs (the Ministry of the Environment, Japan). Concerning the comparison of the calibration curve and Gran' s plot methods, the former was found to be superior to the latter in reproducibility of data. In summary, we can determine fluoride ion in volcanic thermal water by using an ISE with an appropriate TISAB without sample pretreatment like distillation, and there is no need to choose the Gran' s plot method.

## Reference

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