

## Zeta potential measurement of volcanic rocks on 11 island-arc volcanoes in Japan (1) - comparison with SP -

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### Introduction

It is widely believed that the self potential (SP) distribution on volcanoes has information on the subsurface hydrothermal system. Many studies report that SP around active crater or fissures are relatively positive and interpreted those positive SP anomalies as manifestation of upward hydrothermal flow. This interpretation is based on the assumption that the zeta potential is negative in the subsurface rock-water system. Negative value of zeta potential means that the fluid flow carries positive charges to the downstream. However recent experimental study [Hase et al., 2003] showed that rock samples which show positive value of zeta potential are commonly found in Mt. Takadake where the positive correlation between SP and altitudes are observed. They suggested that the positive SP anomaly is explained not only by upward flow but by positive value of zeta potential and downward flow.

In 2003 to 2004, we carried out SP surveys on 11 island arc volcanoes in Japan and showed the variety of the SP profiles. We classified these SP profiles into three types (The Volcanological Society Japan 2004, Shizuoka). One is the no anomaly type. The second is the co-existent type of positive and negative anomaly. This type is also called W-shaped SP profile [Ishido, 2004]. The third is local positive anomaly type. The purpose of this study is to verify whether the variety of SP profiles is caused by variety of the zeta potential of volcanic rocks.

### Experimental procedure

We collected 5-10 volcanic rocks in each volcano. The total samples are 72. The rock samples were cleaned with distilled water in an ultrasonic bath and crushed and sieved to 170 - 355 micro-m in diameter. Then they were saturated with 0.001mol/L NaCl solution, which is background solution of the experiments. In this study, the measurements were carried out with ZetaCad system, and the zeta potential is obtained from the Helmholtz- Smoluchowski equation.

### Results

Among 72 samples, 9 showed the positive value of zeta potential. 11 samples showed relatively small value of zeta potential (-10 to 10 mV). These rock samples which show positive and relatively small value were mainly distribute around the local positive SP anomalies. Therefore it is likely that the local positive SP anomalies are related with the rock on the surface which showed abnormal zeta potential, although detailed mechanism is not fully understood. The rock samples taken from the volcanoes which shows W-shaped SP anomalies shows negative value of zeta potential and those absolute value are more than 10 mV. The zeta potential of the rock samples taken from the volcanoes which shows no SP anomaly is relatively large absolute value. These results suggest that the difference of SP profiles between no anomaly type and W-shaped is not explained by the variety of zeta potential of the surface rocks, but be due to other factors.