

## Geochemistry of the Miocene volcanic rocks distributed around Utsunomiya, central Japan

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Two types of volcanic rocks were reported from Miocene formation distributed in Utsunomiya area, central Japan (Yoshikawa, 1998). Andesite and rhyolite are intercalated with the Kazamiyamada Formation, in the lower, and the Oya Formation, in the upper, respectively. K-Ar whole rock ages of the Kazamiyamada andesite and the Oya rhyolite are reported as 14.8-16.6 Ma and 14.2 Ma, respectively (Yoshikawa, 1998; Yoshikawa et al., 2001). These ages of igneous activity correspond to the opening event of Japan Sea.

The authors reported chemical characteristics of relatively biotite-rich rhyolite occurred in Mt. Haguro (Shimizu and Kawano, 2012), which was called the Haguro rhyolite discriminated from the Oya rhyolite.

This study revealed bulk chemical compositions of the Kazamiyamada andesite, the Oya rhyolite and the Haguro rhyolite. N-MORB normalized incompatible element patterns showed the characteristics of island arc volcanic rocks, that is more LIL elements and less HFS elements. In addition, the Oya rhyolite and the Haguro rhyolite are rich in LIL elements in comparison with the Kazamiyamada andesite. This suggests that both rhyolites were formed in advanced stage of magma differentiation. Also Y and Zr concentrations show lower value in the Haguro rhyolite than the Kazamiyamada andesite. The both volcanic rocks are the suggested to have been differentiated from discrete original magma.

Keywords: andesite, rhyolite, Miocene, Utsunomiya area