K-Ar age connected with initial Ar isotopes and anomalous noble gas isotope ratio, observed in eruption

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The ZAO volcano, which is classified stratovolcano volcano, is located the central Northeast Japan area, and has been active since ca. 1 million years ago approximately. The newest stage started about ca. 35ka. Pyroclastics dominate in this stage. They are further classified into 5 parts: the Kumanodake pyroclastic rocks, the Komakusadaira pyroclastic rocks, the Kattadake pyroclastic rocks, the Umanose agglutinates, the Goshikidake pyroclastic rocks. this newest The volcanic products in the newest stage are classified into medium-K and calc-alkali series of basaltic andesite to andesite, which are regarded to be formed by mixing between felsic and mafic magma in many cases (e.g. Takebe et al., 2015).
The un-spiked Potassium-Argon dating (sensitivity method, i.e. peak-height comparison) can be combined with comprehensive noble gas analysis protocol. When the magma (melts) solidify, it is critical that the initial Ar isotope ratio reaches equilibrium with atmospheric composition. In case that disequilibrium and/or kinetic effect are suggested from isotopic fractionation resulted to the altered initial Ar isotopic ratio from recent atmosphere, the corrected initial isotope ratios were applied to the calculation using with un-spiked K-Ar method. Although Kaneoka (1980) reported that the chemical composition of igneous rock and eruptive condition affect to the noble gas composition, there is a little example of analytical data. Thus, it is necessary to confirm the noble gas isotopic ratio and abundance.
The Zao magmatism of newest volcanic products was reported in Takebe et al. (2009); the respective K-Ar ages of the Komakusadaira pyroclastic rock, the Kattadake pyroclastic rock, Umanose agglutinate is about 30-57ka (one outlier is 100ka), 13ka and 5ka. The newest volcanic products of Zao volcano (the Goshiki pyroclastic rock, the Komakusadaira pyroclastic rock) including historic lava and the neighboring hot spring waters were analyzed by standard noble gas analysis method. We selected and analyzed both low bubbled and high-bubbled sample from each stratigraphy. The noble gas isotopic analysis is performed by noble gas mass spectrometer, GVI-5400He (GV Instruments Co.), in JAMSTEC. We contrived to reduce the atmospheric contamination to sample by using the 60-80 mesh size usually applied to the K-Ar dating. The He isotope ratio was calibrated by the Kaminoyama hot spring gas collected in 1983 (Hanyu and Kaneoka, 1987; Kumagai 1999, Tamura et al, 2005). As the working standard for reference of heavier noble gases for 20ka and older, the age standard samples of YZ-1 (227ka; e.g. Takaoka, 1989; Nagao et al., 1991) from Zao volcano and of MZ-94 (326ka; Iwata et al, 2009) from south Zao volcano were applied.
In terms of the heavier noble gases than Ar, i.e. Kr, Xe, their isotope ratio is similar to the atmospheric ratio; however, their abundance is much concentrated i.e. 10-100 times higher than the atmospheric abundance, even the. Kr and Xe isotopic ratio of YZ and MZ94 having significant anomaly contrasted to the atmospheric ratio. Otherwise, we tried to find the contribution from magmatic composition using He isotopic ratio. Therefore, we tried to clarify any contribution from surface environment for magmatic noble gas in the newest volcanism of Zao volcano.

Keywords: Zao, volcano, K-Ar dating, isotope ratio, Helium

