

## Phengite geochronology of HP-UHP metamorphic rocks: Implication of argon release mechanism during deformation

ITAYA, Tetsumaru<sup>1\*</sup>

<sup>1</sup>Okayama University of Science

A systematic K-Ar age mapping along transects perpendicular to metamorphic thermal gradients have been carried out in the HP schist belts, SW Japan, revealing two contrasting age-T structure relationships. The Sanbagawa HP schist belt in central Shikoku exhibits a thermal structure that the highest grade rocks occur in the middle part of the apparent stratigraphy and a positive correlation in age-T relationship that the ages are progressively older with increasing metamorphic temperature. The similar age-T structure relation is observed in the Suo HP schist belt of the Ishigaki area. In contrast, the Sanbagawa HP schist belt in the Kanto Mtns area and the Suo HP schist belt in the Nishiki area, where the thermal structure for the higher grade zone is in the lower part of the apparent stratigraphic succession, display a negative correlation that younger ages are in higher-grade metamorphic rocks.

Why do these age-T structure relationships appear in the HP schist belts, SW Japan? It is difficult to explain the reason based on the closure temperatures (CT) by the thermally activated diffusion model. CT that has been believed for long time is wrong and must be much higher (ca. 600 C) as revealed by the argon geochronology of the polymetamorphic terrains. This shows the metamorphic sequences mentioned above formed in the temperatures lower than the CT. The HP-UHP schists have been deformed severely during the exhumation of their host rocks and the phengites have experienced the argon release from the phengite crystals by their dynamic recrystallization. The K-Ar ages are related directly to the ductile deformation history of the matrix phengite during exhumation and cooling of the rocks. This suggests that the argon release cease when the ductile deformation of phengites stopped and the K-Ar ages are related to the timing of cease of ductile deformation. This means the phengite (without deformation) included in garnet give a timing of peak metamorphism.

The phengite geochronology of HP-UHP metamorphic rocks in western Alps conducts the following conclusions. Each mica crystal has experienced the different deformation - Ar depletion history during the exhumation of the host rocks and the portions within a crystal have the different history. This phenomenon may be more distinct in the rocks that have experienced the limited deformation history. K-Ar ages of the mica separates from the rocks indicate the average values of the ages from each crystal. To justify this Ar release mechanism requires further investigation using UV laser probe in-situ Ar-Ar analyses of micro-domains in phengite crystal with high sensitive noble gas mass spectrometer.

Keywords: HP-UHP metamorphic rocks, phengite geochronology, deformation, argon release mechanism, closure temperature