Oral | Symbol S (Solid Earth Sciences) | S-GL Geology

[S-GL42_29AM2]Geochronology and Isotope Geology

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Tue. Apr 29, 2014 11:00 AM - 12:45 PM 419 (4F)

Reliable reconstruction of geohistory is of primary importance to better envision the present and future of the Earth. Geochronology and isotope geology play major roles in the reconstruction. This session offers an opportunity to present the results of fundamental studies, including the developments / improvements of analytical methods and age calibration, as well as applications to the Earth and planetary materials. We particularly focus on: (1) radiometric dating, bio-stratigraphy, magneto-stratigraphy and stable isotopic time series that provide the age information, (2) radioisotopes and stable isotopes widely employed for analyzing the Earth and planetary systems and (3) hypothesis and numerical modeling that utilize / assimilate the age and isotopic data. We also welcome contributions that integrate a variety of relevant disciplines.

12:25 PM - 12:40 PM

[SGL42-P03_PG]Diffusion experiment by stepwise heating and muscovite

3-min talk in an oral session

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Keywords:diffusion experiment, argon, closure temperature, stepwise heating, muscovite

It is generally recognized that diffusion experiment on micas in vacuum during stepwise heating for $^{40}Ar/^{39}Ar$ dating was unsuitable for diffusion studies because of the destruction of crystal structure from dehydration. However, we showed that estimates of closure temperature from single grain biotites during laser heating experiment gives reasonable values. The problem in case of muscovite is that it seems to have structural transition or significant destruction between 600 and 700°C. The recent study using hydrothermal environment reported the activation energy E of 63 kcal/mole and an estimation of closure temperature exceeding 400°C. The high E and closure temperature T_c are derived on the steep slope in Arrhenius plot. Without change in crystal structure, muscovite does not give high E and Tc. This is contradictory for samples with high E and T_c. It is necessary to separate diffusion phenomena from structural change, and even a hydrothermal experiment at high temperatures in a laboratory may not be suitable for such studies. Muscovite is known to have relatively high T_c in field. To make a practical estimate for T_c, it is necessary to consider both laboratory and field setting.