

## Diffusion experiment by stepwise heating and muscovite

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It is generally recognized that diffusion experiment on micas in vacuum during stepwise heating for  $^{40}\text{Ar}/^{39}\text{Ar}$  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  $T_c$ . 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.

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