JRR3 research reactor and single grain $^{40}Ar/^{39}Ar$ dating by laser step heating

Hironobu Hyodo[1]

[1] RINS,Okayama Univ. of Sci., Kobe Univ.

The effect of neutron flux inhomogeneity on laser $^{40}Ar/^{39}Ar$ single grain dating during irradiation experiment on age standards in JRR3 research reactor of Japan Atomic Energy Agency is investigated from the disctribution of J-values. JRR3 does not require an air-tight glass ampule for a sample. Sample preparation is relatively easy since no use of heat for sealing, and adding cadmium shielding is a simple procedure. These points make JRR3 a good candidate for an irradiation facility. We evaluate the results of J-values, potassium and calcium corrections in terms of characterization of JRR3 for single grain $^{40}Ar/^{39}Ar$ dating.

JMTR and JRR3 research reactor were practically used by Kaneoka (1996) and Ishizuka et al. (2002) for laser heating $^{40}Ar/^{39}Ar$ dating. They confirmed the homogeneity of neutron flux in a-few-centimeters scale using SORI biotite (JG-1). 3grHb (60-80 mesh size) prepared by Roddick (1983) is often used for laser heating $^{40}Ar/^{39}Ar$ studies, and its homogeneity is confirmed by Baksi and others. The air contamination is less than 1% due to its old age of 1Ga, and it is suitable for an age standard. However, individual J-values from single grains showed relatively large errors, and random distribution of J-values are observed over the volume of a 15 diameter x 18L cylinder. Weighted averages of these J-values usually give less than 1% error, but the variance seem to be relatively large. These large variation may originate from statistical variation of natural samples, inhomogeneity flux as well as measurement condition such as stability of mass spectrometer and temperature control. J-value distribution and agreement between duplicates of unknowns are taken into account for the analysis.