**40Ar/39Ar Analytical Information for AG01-02 and AG01-01 (ANU CAN #110)**

*Flux Monitor:* GA 1550 @ 98.5 ± 0.8 Ma (Spell & McDougall, 2003)

(Ar36/Ar37) Ca correction factor 3.5E-04

(Ar39/Ar37) Ca correction factor 7.96E-04

(Ar40/Ar39) K correction factor 2.7E-02

(38Ar/39Ar) K correction factor 1.15E-2

Ca/K conversion factor 1.90 x 39Ar/37Ar

Discrimination factor 1.00815 ±0.17%

Lambda K40 5.5430E-10

Abundances were corrected for background, mass discrimination, and radioactive decay and interfering nuclear isotopes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SampleName | J Factor | ± % error on J | Mineral | Measurement Date |
| AG01-01 | 4.5292E-3 | 0.277 | K-feldspar | Apr 2004 |
| AG01-02 | 4.5321E-3 | 0.298 | K-feldspar | Apr 2004 |

The canister irradiated for 193 hrs at the ANSTO HIFAR Reactor, Sydney Australia on December 19-27, 2003. During the irradiation the canister had inverted every second day for the total of 3 inversion.

**Tables 1 and 2 show analysis data:**

Tables 1 and 2 list the isotope abundances and % error, temperature schedules, 40Ar\* (%), 40Ar\*/39Ar(K), cumulative 39Ar (%), Ca/K and Cl/K, uncertainty level of the measured isotopes intensity and the calculated ages (1 σ) for each step.

The location of both samples is N: 36.71071667, E: 25.29366667; Datum WGS84.

**MINERAL SEPARATION AND CHARACTERISATION:**

Samples were chosen for their structural context, AG01-01 to represent a mylonite from the core of a north-sense shear zone, AG01-02 for a south-sense shear zone with overprinting of north-sense. Both samples are pristine potassium feldspars, AG01-02 from an augengneiss and AG01-01 from a gneiss. Samples were collected by G Lister and M Forster in October 2001.

Mineral separation was undertaken to collect potassium feldspars that represented the north sense of shear for AG01-01, and south sense of shear for AG01-02 (noting that north sense shearing was overprinting feldspars in this sample). Specific cm-scale zones with these feldspars were cut from the rock and then separated using the traditional crushing methods and heavy liquid floatation before final separation, grains sized between 150 µm and 250 µm were chosen. All samples were washed in deionized water prior to final hand picking to produce a 99% pure sample for analysis.

**SAMPLE IRRADIATION DETAILS:**

The prepared grains were wrapped in aluminium packets and placed into an aluminium irradiation canister together with aliquots of the flux monitor biotite GA1550. Packets containing K2SO4 were placed at either end of the canister to monitor 40Ar production from potassium.

Irradiation of samples for 40Ar/39Ar analysis was undertaken at the HIFAR nuclear reactor in Australian prior to analysis. Irradiated samples were unwrapped on their return to the Research School of Earth Science, and then rewrapped in tin-foil. Backgrounds were measured prior to each step analysis and subtracted from each step analysis. For analysis samples were dropped into the furnace and the tin-foil melted and gas pumped away prior to analysis of sample. Potassium feldspars where analysed with 43 steps, with two or more isothermal steps at each new temperature, and with temperatures of the overall schedule rising from 450°C to 1450°C (Lovera et al., 1989). The furnace was degassed and decontaminated between samples at 1450°C for 30 minutes and gas pumped away. Temperature increases in the schedule were increased in small temperature jumps so as to minimize mixing of different gas populations on each step (Tables 1 and 2). Fluence monitors, GA 1550, were analyzed using an argon-ion continuous wave laser and the VG3600 Mass Spectrometer. Gas released from each step was exposed to Zr-Al getters to remove active gases for 12 minutes, the purified gas then being isotopically analyzed in the mass spectrometer. 40K abundances and decay constants are taken from standard values recommended by the IUGS subcommission on Geochronology [Steiger and Jager, 1977]. Stated precisions for 40Ar/39Ar ages include all uncertainties in the measurement of isotope ratios and are quoted at the 1 sigma level. The reported data have been corrected for system backgrounds, mass discrimination, fluence gradients and atmospheric contamination. Errors associated with the age determinations are one sigma uncertainties and exclude errors in the age of the fluence monitor GA1550. Decay constants are those of Steiger & Jager (1977). The 40Ar/39Ar dating technique is described in detail by MacDougall and Harrison (1999).

Samples were analysed in the Argon Laboratory at the Research School of Earth Science, The Australian National University, Canberra, Australia. Samples were analysed using the furnace step-heating technique, flux monitors were analysed with the fusion technique with the argon-ion continuous wave laser, both were analysed in the VG3600 mass spectrometer with 100% gas release of 39Ar.

**References:**

Tetley, N., I. McDougall, & H. R. Heydegger. 1980. Thermal neutron interferences in the 40Ar/39Ar dating technique. *Journal Geophysical Research*, **85**, 7201– 7205.

McDougall, I., & T. M. Harrison (Eds.). 1999. Geochronology and Thermochronology by the 40Ar/39Ar Method, 2nd ed., 269 pp. Oxford Univ. Press, New York.

Lovera, O. M., F. M. Richter, & T. M. Harrison. 1989. 40Ar/39Ar thermochronometry for slowly cooled samples having a distribution of diffusion domain sizes. *Journal Geophysical Research,* **94**, 17, 917– 17,935.

Spell, T. L., & I. McDougall. 2003. Characterization and calibration of 40Ar/39Ar dating standards. *Chemical Geology*, **198**, 189–211.

Steiger, R. H., & E. Jager. 1977. Subcommission on geochronology: Convention on the use of decay constants in geo- and cosmochronology. *Earth Planetary Science Letters*, **36**, 359–362.

**XML data for forward modelling using the MacArgon program:**

Input data for MacArgon for forward modelling for Sample AG01-01

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<sample\_number>AG01-01</sample\_number>

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 2 0.020000 0.040000 1158.840000 7.310000

 3 0.040000 0.090000 67.050000 2.530000

 4 0.090000 0.210000 388.720000 1.870000

 5 0.210000 0.420000 29.870000 0.450000

 6 0.420000 0.840000 161.240000 0.920000

 7 0.840000 1.500000 20.820000 0.130000

 8 1.500000 2.440000 69.930000 0.250000

 9 2.440000 3.900000 18.180000 0.080000

 10 3.900000 5.640000 34.290000 0.160000

 11 5.640000 7.980000 16.390000 0.090000

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 13 10.520000 13.650000 17.010000 0.070000

 14 13.650000 16.360000 18.610000 0.080000

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 16 19.860000 22.760000 17.500000 0.080000

 17 22.760000 26.430000 16.430000 0.070000

 18 26.430000 29.160000 17.450000 0.080000

 19 29.160000 32.700000 16.890000 0.070000

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 23 43.790000 46.100000 20.420000 0.100000

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 25 49.430000 52.590000 22.520000 0.080000

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 30 69.230000 74.350000 27.940000 0.150000

 31 74.350000 78.060000 29.650000 0.180000

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 33 81.090000 83.690000 38.750000 0.370000

 34 83.690000 85.290000 41.440000 0.840000

 35 85.290000 86.980000 43.140000 1.400000

 36 86.980000 87.740000 46.210000 0.630000

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 13 750 35

 14 800 15

 15 800 35

 16 850 15

 17 850 35

 18 900 15

 19 900 35

 20 950 15

 21 950 35

 22 950 70

 23 1000 15

 24 1000 35

 25 1050 15

 26 1050 35

 27 1050 70

 28 1100 15

 29 1100 35

 30 1100 70

 31 1100 120

 32 1100 180

 33 1100 280

 34 1100 400

 35 1100 800

 36 1200 15

 37 1230 15

 38 1260 15

 39 1290 15

 40 1320 15

 41 1350 15

 42 1450 30

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Input data for MacArgon for forward modelling for Sample AG01-02

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 37 89.020000 90.160000 64.020000 0.270000

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