**Table DR-1.1 $^{40}Ar/^{39}Ar$ Furnace Analytical Data**

| T(K) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | % $^{39}Ar$ | % $^{40}Ar^*$ | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *NB12-11 biotite (J value: 0.0038 ± 0.000076)* | | | | | | |
| 900 | 0.1093 | 0.0006 | 2.9 | 81.5 | 98.17 | 50.4 ± 1.0 |
| 950 | 0.1229 | 0.0003 | 9.5 | 91.5 | 99.56 | 50.3 ± 1.0 |
| 1000 | 0.1278 | 0.0002 | 17.6 | 93.7 | 190.89 | 49.6 ± 1.0 |
| 1050 | 0.1271 | 0.0001 | 24.4 | 95.8 | 507.01 | 50.9 ± 1.0 |
| 1100 | 0.1275 | 0.0002 | 29.7 | 94.4 | 116.48 | 50.1 ± 1.0 |
| 1150 | 0.1252 | 0.0002 | 34.1 | 95.4 | 95.41 | 51.5 ± 1.0 |
| 1200 | 0.1251 | 0.0002 | 39.4 | 95.3 | 61.71 | 51.5 ± 1.0 |
| 1250 | 0.1293 | 0.0001 | 51.5 | 96.9 | 90.83 | 50.6 ± 1.0 |
| 1350 | 0.1316 | 0.0001 | 90.3 | 97.9 | 48.57 | 50.3 ± 1.0 |
| 1550 | 0.1232 | 0.0003 | 100.0 | 92.2 | 6.30 | 50.6 ± 1.0 |
| *NB12-11 K-feldspar (J value: 0.00146 ± 0.000056)* | | | | | | |
| 750** | 0.0481 | 0.0002 | 1.0 | 93.6 | 53.49 | 50.5 ± 1.9 |
| 775** | 0.0375 | 0.0008 | 2.7 | 75.2 | 3054.41 | 52.0 ± 2.0 |
| 800** | 0.0446 | 0.0003 | 4.6 | 89.8 | 1426.82 | 52.3 ± 2.0 |
| 825** | 0.0492 | 0.0001 | 7.0 | 98.5 | 1555.40 | 52.0 ± 2.0 |
| 850** | 0.0494 | 0.0001 | 9.7 | 97.9 | 147.22 | 51.5 ± 1.9 |
| 875** | 0.0494 | 0.0001 | 12.7 | 98.1 | 444.19 | 51.6 ± 1.9 |
| 900** | 0.0494 | 0.0001 | 15.8 | 98.3 | 102.31 | 51.7 ± 2.0 |
| 950** | 0.0492 | 0.0001 | 20.6 | 98.4 | 161.28 | 52.0 ± 2.0 |
| 1000** | 0.0496 | 0.0001 | 26.0 | 97.8 | 129.18 | 51.1 ± 1.9 |
| 1050** | 0.0494 | 0.0001 | 31.1 | 99.3 | 0.00 | 52.2 ± 2.0 |
| 1100** | 0.0493 | 0.0001 | 35.6 | 99.9 | 426.96 | 52.6 ± 2.0 |
| 1150* | 0.0485 | 0.0001 | 40.2 | 97.8 | 209.52 | 52.3 ± 2.0 |
| 1200* | 0.0459 | 0.0001 | 56.6 | 97.6 | 256.43 | 55.1 ± 2.1 |
| 1250* | 0.0447 | 0.0001 | 58.3 | 99.5 | 569.63 | 57.7 ± 2.2 |
| 1300* | 0.0426 | 0.0001 | 62.8 | 96.0 | 103.95 | 58.4 ± 2.2 |
| 1350* | 0.0419 | 0.0001 | 76.5 | 96.3 | 616.32 | 59.5 ± 2.2 |
| 1550* | 0.0413 | 0.0002 | 100.0 | 94.8 | 407.58 | 59.4 ± 2.2 |

Biotite: Mg/(Mg + Fe) = 0.420; K-Feldspar: K-Na binary solid solution, $X_{Or}$ = 0.904. $^{40}Ar^*$(%)—percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$. K-Feldspar increments are 10 minutes in duration; other samples are 5 minutes.

**Table DR-1.2 $^{40}Ar/^{39}Ar$ Furnace Analytical Data**

| T(K) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | $^{39}Ar$(%) | % $^{40}Ar$* | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *B85 K-feldspar (J value: 0.002030792 ± 0.000029756)* | | | | | | |
| 700+ | 0.0025 | 0.0032 | 0.7 | 4.5 | 41.38 | 73.3 ± 1.0 |
| 725+ | 0.0225 | 0.0026 | 1.0 | 21.9 | 1075.72 | 40.1 ± 0.5 |
| 750+ | 0.0412 | 0.0019 | 1.5 | 43.0 | 13.00 | 43.0 ± 0.5 |
| 775+ | 0.0574 | 0.0017 | 2.0 | 50.5 | 10.70 | 36.3 ± 0.5 |
| 800+ | 0.0648 | 0.0011 | 2.7 | 66.9 | 31.06 | 42.4 ± 0.5 |
| 825+ | 0.0734 | 0.0010 | 3.6 | 70.9 | 127.62 | 39.8 ± 0.5 |
| 850+ | 0.0774 | 0.0007 | 4.6 | 80.3 | 63.07 | 42.6 ± 0.5 |
| 875+ | 0.0780 | 0.0002 | 5.9 | 93.3 | 41.92 | 49.1 ± 0.6 |
| 900+ | 0.0778 | 0.0007 | 7.2 | 78.3 | 40.37 | 41.4 ± 0.5 |
| 925+ | 0.0795 | 0.0003 | 8.6 | 90.2 | 27.99 | 46.6 ± 0.6 |
| 950 | 0.0753 | 0.0004 | 10.1 | 87.1 | 29.68 | 47.6 ± 0.6 |
| 975 | 0.0752 | 0.0004 | 11.6 | 87.1 | 19.71 | 47.6 ± 0.6 |
| 1000 | 0.0558 | 0.0012 | 15.2 | 65.3 | 20.31 | 48.0 ± 0.6 |
| 1050 | 0.0781 | 0.0003 | 27.6 | 92.0 | 29.77 | 48.4 ± 0.6 |
| 1100 | 0.0734 | 0.0005 | 31.7 | 85.9 | 28.14 | 48.1 ± 0.6 |
| 1150 | 0.0708 | 0.0006 | 36.2 | 82.5 | 30.76 | 47.9 ± 0.6 |
| 1200 | 0.0727 | 0.0006 | 42.6 | 83.1 | 40.59 | 47.0 ± 0.6 |
| 1250 | 0.0739 | 0.0005 | 54.3 | 86.1 | 43.34 | 47.9 ± 0.6 |
| 1300 | 0.0738 | 0.0005 | 72.4 | 85.8 | 34.29 | 47.8 ± 0.6 |
| 1350 | 0.0753 | 0.0004 | 100.0 | 87.5 | 28.07 | 47.8 ± 0.6 |

$^{40}Ar^*$(%)—percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$. K-Feldspar increments are 10 minutes in duration; other samples are 5 minutes.
+Excluded from isochron regression.

**Table DR-1.3 $^{40}Ar/^{39}Ar$ Furnace Analytical Data**

| T(K) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | $^{39}Ar$(%) | % $^{40}Ar$* | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *EM3b muscovite (J value: 0.0038 ± 0.000076)* | | | | | | |
| 900 | 0.0886 | 0.0012 | 3.4 | 65.1 | 45.17 | 49.7 ± 1.0 |
| 950 | 0.1091 | 0.0004 | 4.2 | 88.7 | 56.27 | 54.9 ± 1.1 |
| 1000 | 0.1059 | 0.0008 | 6.1 | 77.5 | 171.05 | 49.5 ± 1.0 |
| 1050 | 0.1052 | 0.0008 | 10.2 | 77.6 | 112.47 | 49.9 ± 1.0 |
| 1100 | 0.1218 | 0.0004 | 27.6 | 88.1 | 195.85 | 48.9 ± 1.3 |
| 1150 | 0.1269 | 0.0003 | 39.3 | 92.0 | 96.10 | 49.0 ± 1.0 |
| 1200 | 0.1225 | 0.0003 | 48.5 | 90.3 | 226.57 | 49.9 ± 1.0 |
| 1250 | 0.1229 | 0.0004 | 57.5 | 89.3 | 238.85 | 49.2 ± 1.0 |
| 1350 | 0.1313 | 0.0002 | 95.2 | 95.4 | 594.75 | 49.1 ± 1.0 |
| 1550 | 0.0949 | 0.0009 | 100.0 | 73.0 | 35.02 | 52.0 ± 1.0 |
| *EM3b K-feldspar (J value: 0.00146 ± 0.000056)* | | | | | | |
| 725+ | 0.0089 | 0.0025 | 2.1 | 27.4 | 49.32 | 79.1 ± 3.0 |
| 750** | 0.0452 | 0.0004 | 5.6 | 89.4 | 27.03 | 51.4 ± 1.9 |
| 775** | 0.0308 | 0.0012 | 7.2 | 63.2 | 20.44 | 53.3 ± 2.0 |
| 800** | 0.0394 | 0.0008 | 8.9 | 76.4 | 17.25 | 50.3 ± 1.9 |
| 825** | 0.0468 | 0.0004 | 10.6 | 87.4 | 19.22 | 48.5 ± 1.8 |
| 850** | 0.0485 | 0.0001 | 12.4 | 98.7 | 17.32 | 52.8 ± 2.0 |
| 875** | 0.0492 | 0.0001 | 14.5 | 99.4 | 30.44 | 52.5 ± 2.0 |
| 900** | 0.0493 | 0.0002 | 16.8 | 95.4 | 33.42 | 50.2 ± 1.9 |
| 950** | 0.0497 | 0.0001 | 21.6 | 97.8 | 50.89 | 51.1 ± 1.9 |
| 1000** | 0.0501 | 0.0001 | 30.7 | 98.9 | 151.57 | 51.3 ± 1.9 |
| 1050* | 0.0498 | 0.0001 | 39.9 | 98.3 | 117.60 | 51.2 ± 1.9 |
| 1100* | 0.0489 | 0.0001 | 45.5 | 99.4 | 130.83 | 52.7 ± 2.0 |
| 1150* | 0.0479 | 0.0001 | 49.9 | 97.9 | 86.71 | 53.0 ± 2.0 |
| 1200* | 0.0457 | 0.0001 | 54.7 | 97.8 | 74.69 | 55.5 ± 2.1 |
| 1250* | 0.0428 | 0.0001 | 61.1 | 95.7 | 65.89 | 58.0 ± 2.2 |
| 1300* | 0.0400 | 0.0003 | 72.0 | 92.0 | 46.53 | 59.6 ± 2.2 |
| 1350* | 0.0398 | 0.0003 | 89.9 | 91.5 | 92.10 | 59.5 ± 2.2 |
| 1550* | 0.0377 | 0.0003 | 100.0 | 89.7 | 174.29 | 61.6 ± 2.3 |

Muscovite: $(Fe_{TOTAL} + Mg)/Al^{VI} = 0.18$, $Si^{IV}/(Si^{IV}+Al^{IV}) = 0.79$, and Na/(Na+K) = 0.006; K-feldspar: ($X_{Or} = 0.882$). $^{40}Ar^*$(%): percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$. K-Feldspar increments are 10 minutes in duration; other samples are 5 minutes. *Points included in isochron regression of high temperature K-feldspar steps; **included in the isochron regression of low temperature steps. +Excluded from isochron regression.

**Table DR-1.4 $^{40}Ar/^{39}Ar$ Furnace Analytical Data**

| T(K) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | $^{39}Ar(\%)$ | % $^{40}Ar^*$ | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *EM3c biotite (J value: 0.0038 ± 0.000076)* | | | | | | |
| 900 | 0.1093 | 0.0007 | 14.7 | 80.3 | 75.55 | 49.7 ± 1.0 |
| 950 | 0.1131 | 0.0006 | 17.8 | 81.6 | 86.78 | 48.8 ± 1.0 |
| 1000 | 0.1217 | 0.0003 | 21.8 | 89.7 | 103.53 | 49.9 ± 1.0 |
| 1050 | 0.1241 | 0.0003 | 29.5 | 91.6 | 55.03 | 49.9 ± 1.0 |
| 1100 | 0.1209 | 0.0004 | 35.0 | 87.6 | 38.37 | 49.0 ± 1.0 |
| 1150 | 0.1173 | 0.0005 | 39.4 | 84.3 | 40.10 | 48.6 ± 1.0 |
| 1200 | 0.1175 | 0.0005 | 46.1 | 85.7 | 43.74 | 49.4 ± 1.0 |
| 1250 | 0.1263 | 0.0003 | 61.5 | 92.3 | 104.00 | 49.5 ± 1.0 |
| 1350 | 0.1296 | 0.0002 | 91.2 | 94.6 | 52.97 | 49.4 ± 1.0 |
| 1550 | 0.1146 | 0.0005 | 100.0 | 84.8 | 7.10 | 50.0 ± 1.0 |

Biotite (Mg/(Mg + Fe) = 0.391. $^{40}Ar^*(\%)$: percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$. K-Feldspar increments are 10 minutes in duration; other samples are 5 minutes.

**Table DR-1.5 $^{40}Ar/^{39}Ar$ Furnace Analytical Data.**

| T(K) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | $^{39}Ar(\%)$ | % $^{40}Ar^*$ | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *EM3d hornblende (J value: 0.00146 ± 0.000056)* | | | | | | |
| 1100+ | 0.0285 | 0.0015 | 1.5 | 55.7 | 0.41 | 50.7 ± 1.9 |
| 1175+ | 0.0268 | 0.0013 | 2.2 | 62.3 | 0.22 | 60.1 ± 2.3 |
| 1200 | 0.0276 | 0.0008 | 3.6 | 76.2 | 0.20 | 71.3 ± 2.7 |
| 1225 | 0.0307 | 0.0005 | 6.6 | 86.5 | 0.22 | 72.7 ± 2.7 |
| 1250 | 0.0330 | 0.0002 | 15.0 | 93.8 | 0.25 | 73.3 ± 2.8 |
| 1275 | 0.0363 | 0.0002 | 53.5 | 94.7 | 0.28 | 67.5 ± 2.5 |
| 1300 | 0.0373 | 0.0001 | 69.9 | 97.2 | 0.30 | 67.3 ± 2.5 |
| 1325 | 0.0326 | 0.0002 | 73.7 | 92.6 | 0.27 | 73.2 ± 2.8 |
| 1350 | 0.0343 | 0.0001 | 79.4 | 97.9 | 0.28 | 73.6 ± 2.8 |
| 1550 | 0.0345 | 0.0002 | 100.0 | 93.2 | 0.27 | 69.8 ± 2.6 |
| *EM3d biotite (J value: 0.00146 ± 0.000056)* | | | | | | |
| 900 | 0.0304 | 0.0013 | 6.3 | 60.1 | 41.82 | 51.4 ± 1.9 |
| 950 | 0.0432 | 0.0003 | 13.7 | 91.3 | 53.16 | 54.8 ± 2.1 |
| 1000 | 0.0448 | 0.0002 | 21.4 | 95.3 | 53.73 | 55.2 ± 2.1 |
| 1050 | 0.0449 | 0.0002 | 28.5 | 94.8 | 135.08 | 54.8 ± 2.1 |
| 1100 | 0.0443 | 0.0001 | 34.5 | 96.2 | 49.82 | 56.3 ± 2.1 |
| 1150 | 0.0431 | 0.0002 | 43.7 | 94.2 | 77.95 | 56.6 ± 2.1 |
| 1200 | 0.0446 | 0.0001 | 58.4 | 97.3 | 59.16 | 56.6 ± 2.1 |
| 1250 | 0.0456 | 0.0001 | 73.9 | 97.3 | 23.89 | 55.3 ± 2.1 |
| 1350 | 0.0463 | 0.0001 | 95.8 | 97.7 | 27.52 | 54.8 ± 2.1 |
| 1550 | 0.0442 | 0.0001 | 100.0 | 96.3 | 7.67 | 56.4 ± 2.1 |

Biotite (Mg/(Mg + Fe) = 0.592. $^{40}Ar^*(\%)$—percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$. K-Feldspar increments are 10 minutes in duration; other samples are 5 minutes. +Excluded from isochron regression.

**Table DR-1.6 $^{40}Ar/^{39}Ar$ Furnace Analytical Data, continued.**

| T(K) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | $^{39}Ar$(%) | % $^{40}Ar$* | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *EM6 biotite (J value: 0.00146 ± 0.000056)* | | | | | | |
| 900 | 0.0379 | 0.0007 | 14.9 | 79.8 | 310.08 | 54.6 ± 2.1 |
| 950 | 0.0448 | 0.0003 | 18.5 | 89.9 | 63.14 | 52.1 ± 2.0 |
| 1000 | 0.0434 | 0.0004 | 23.3 | 89.0 | 340.71 | 53.2 ± 2.0 |
| 1050 | 0.0420 | 0.0003 | 28.1 | 89.9 | 101.87 | 55.6 ± 2.1 |
| 1100 | 0.0420 | 0.0004 | 32.5 | 89.3 | 102.37 | 55.2 ± 2.1 |
| 1150 | 0.0414 | 0.0003 | 38.3 | 89.8 | 61.95 | 56.3 ± 2.1 |
| 1200 | 0.0432 | 0.0002 | 49.5 | 93.4 | 37.23 | 56.0 ± 2.1 |
| 1250 | 0.0452 | 0.0002 | 65.6 | 94.7 | 39.86 | 54.4 ± 2.1 |
| 1350 | 0.0471 | 0.0001 | 97.1 | 97.6 | 65.09 | 53.8 ± 2.0 |
| 1550 | 0.0455 | 0.0001 | 100.0 | 98.4 | 12.27 | 56.1 ± 2.1 |
| *EM6 hornblende (J value: 0.00146 ± 0.000056)* | | | | | | |
| 1000+ | 0.0279 | 0.0001 | 1.0 | 99.2 | 1.17 | 91.1 ± 3.4 |
| 1100 | 0.0325 | 0.0005 | 1.8 | 84.4 | 0.56 | 67.1 ± 2.5 |
| 1150 | 0.0365 | 0.0002 | 10.1 | 92.7 | 0.32 | 65.6 ± 2.5 |
| 1175 | 0.0381 | 0.0002 | 21.4 | 92.8 | 0.29 | 63.0 ± 2.4 |
| 1200 | 0.0375 | 0.0001 | 40.9 | 96.1 | 0.29 | 66.2 ± 2.5 |
| 1220 | 0.0388 | 0.0001 | 63.8 | 98.1 | 0.29 | 65.4 ± 2.5 |
| 1240 | 0.0403 | 0.0001 | 76.8 | 98.5 | 0.30 | 63.2 ± 2.4 |
| 1280 | 0.0380 | 0.0004 | 78.6 | 88.7 | 0.29 | 60.4 ± 2.3 |
| 1300 | 0.0379 | 0.0001 | 81.8 | 96.1 | 0.26 | 65.6 ± 2.5 |
| 1325 | 0.0375 | 0.0001 | 93.7 | 97.4 | 0.25 | 67.3 ± 2.5 |
| 1350 | 0.0377 | 0.0003 | 99.1 | 90.9 | 0.24 | 62.5 ± 2.4 |
| 1400 | 0.0364 | 0.0002 | 99.8 | 94.4 | 0.24 | 67.0 ± 2.5 |
| 1550 | 0.0281 | 0.0012 | 100.0 | 65.1 | 0.23 | 60.1 ± 2.3 |

$^{40}Ar^*$(%)—percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$. K-Feldspar increments are 10 minutes in duration; other samples are 5 minutes.
+Excluded from isochron regression.

**Table DR-1.7 $^{40}Ar/^{39}Ar$ Laser Fusion & Step Heating Analytical Data**

| Subsample | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | $^{39}Ar_K$ | % $^{40}Ar^*$ | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *B85 hornblende (J value: 0.00159551± 0.000098)* | | | | | | |
| 1 | 0.0397 | 0.0007 | 14.5 | 78.7 | 0.04 | 56.2 ± 3.4 |
| 2 | 0.0248 | 0.0020 | 23.2 | 40.1 | 0.02 | 46.0 ± 2.8 |
| 3 | 0.0448 | 0.0005 | 49.5 | 84.2 | 0.08 | 53.3 ± 3.3 |
| 4 | 0.0365 | 0.0011 | 64.6 | 66.3 | 0.04 | 51.6 ± 3.1 |
| 5 | 0.0566 | 0.0004 | 86.9 | 87.0 | 0.11 | 43.7 ± 2.7 |
| 6 | 0.0335 | 0.0014 | 100.0 | 57.4 | 0.04 | 48.7 ± 3.0 |
| *B85 biotite (J value: 0.00159551± 0.000098)* | | | | | | |
| 18 | 0.0547 | 0.0002 | 90.1 | 92.9 | 43.48 | 48.2 ± 1.0 |
| 20 | 0.0518 | 0.0006 | 100.0 | 83.1 | 9.05 | 45.6 ± 0.9 |

| Inc. (Amp) | $^{39}Ar/^{40}Ar$ | $^{36}Ar/^{40}Ar$ | % $^{39}Ar$ | % $^{40}Ar^*$ | K/Ca | Age ( ± 2σ) |
|---|---|---|---|---|---|---|
| *B85 biotite (J value: 0.00159551± 0.000098)* | | | | | | |
| 11.5 | 0.0393 | 0.0014 | 4.9 | 58.9 | 1.28 | 42.6 ± 0.8 |
| 12.5 | 0.0513 | 0.0006 | 11.9 | 83.6 | 3.58 | 46.3 ± 0.9 |
| 13 | 0.0567 | 0.0002 | 19.9 | 93.1 | 5.30 | 46.7 ± 0.9 |
| 13.5 | 0.0503 | 0.0005 | 29.0 | 85.4 | 3.53 | 48.2 ± 1.0 |
| 14 | 0.0557 | 0.0001 | 41.1 | 95.8 | 3.32 | 48.9 ± 1.0 |
| 14.5 | 0.0557 | 0.0000 | 50.2 | 98.8 | 13.53 | 50.3 ± 1.0 |
| 15 | 0.0551 | 0.0000 | 59.9 | 98.8 | 37.68 | 50.9 ± 1.0 |
| 17 | 0.0563 | 0.0001 | 81.6 | 96.9 | 106.03 | 48.9 ± 1.0 |

$^{39}Ar_K$: moles of irradiation-produced $^{39}Ar$ released during laser fusion. $\%^{40}Ar^*$: percentage of measured $^{40}Ar$ derived from natural decay of $^{40}K$.