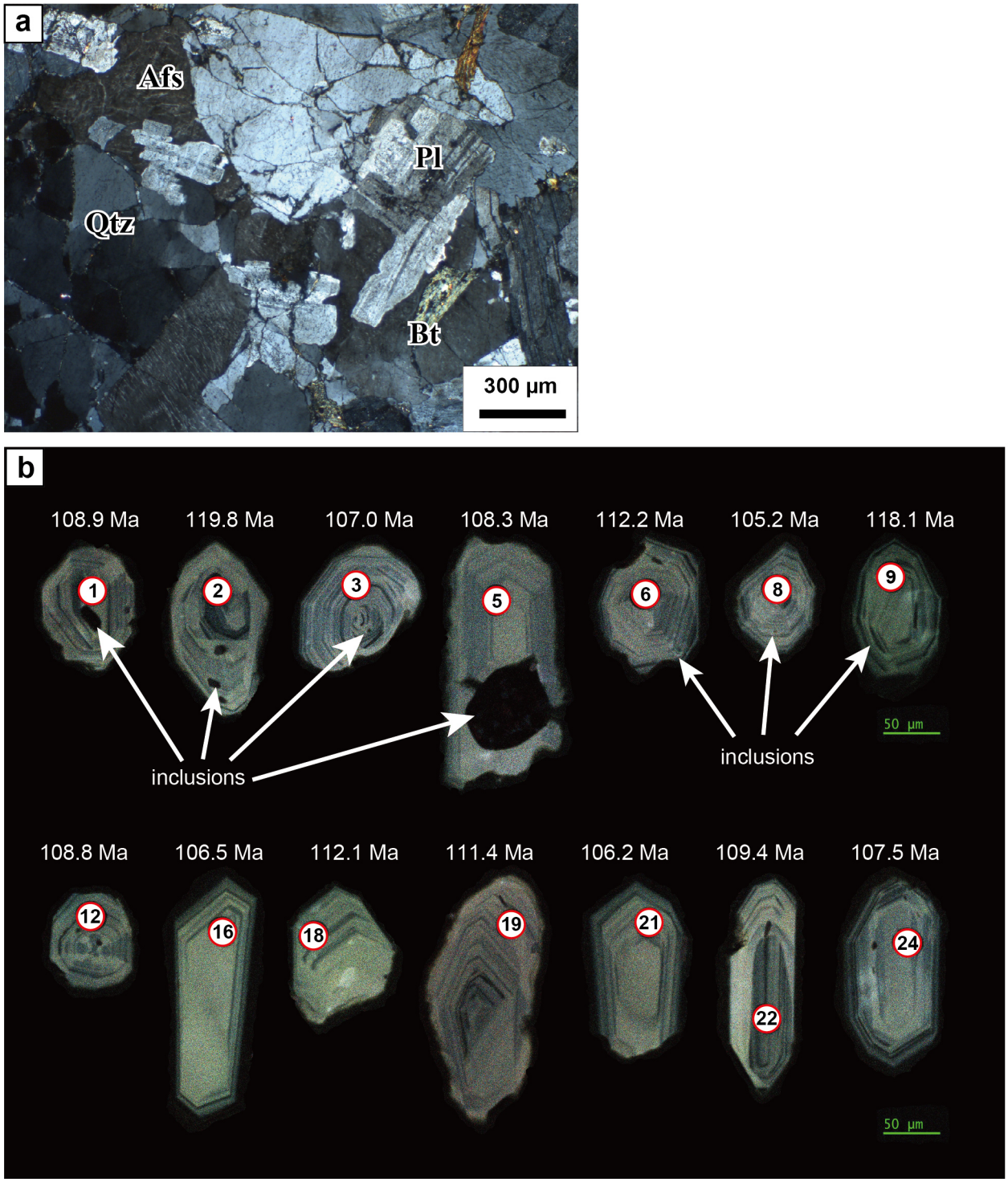


Fig. A1. a) Microphotograph of sample MGD-02 (crosspolarized light). Afs: Alkali feldspar, Bt: biotite, Pl: plagioclase, Qtz: quartz. b) Cathodoluminescence images of the concordant zircons separated from sample MGD-02. The diameter of each spot (with the spot number) is 25 µm. The yellow scale bar is 50 µm.

Table A1 The LA-ICPMS analytical conditions for U–Pb dating in this study.

| **Laser Ablation System** | | | |
|---|---|---|---|
| Instrument | NWR-213 frequency quadrupled Nd-YAG laser | | |
| Laser wave length | 213 nm | | |
| Repetition rate | 10 Hz | | |
| Spot size | 25 μm | | |
| Ablation time | 8 s (Pre-ablation) + 10 s | | |
| He gas flow rate | 1.0 L / min | | |
| **Inductively Coupled Plasma Mass Spectrometer** | | | |
| Instrument | Agilent 7700x | | |
| Forward power | 1400 W | | |
| Monitor elements | $^{202}$Hg , $^{204}$(Hg + Pb), $^{206}$Pb, $^{207}$Pb, $^{208}$Pb , $^{232}$Th, $^{238}$U | | |
| Ar gas flow rate | 1.0 ± 0.1 L / min | | |
| Scan mode | Peak jumping mode | | |
| Detecer mode | Pulse counting | | |
| **Standard Material** | | | |
| Primary standard | NIST SRM 610 (Walder et al., 1993) | | |
| | $^{206}$Pb/$^{238}$U ratio of NIST SRM 610 normalized by 91500 | | |
| %2SD | $^{206}$Pb/$^{238}$U | $^{207}$Pb/$^{206}$Pb | $^{208}$Pb/$^{232}$Th |
| | 1.6–3.9 | 1.7–2.5 | 2.3–3.0 |
| Secondary standard | 91500 (Wiedenbeck et al., 1995) | | |
| | OD-3 (Iwano et al., 2012) | | |

## *References*


Iwano et al., 2012, *J. Geol. Soc. Japan*, **118**, 365–375.

Walder et al., 1993, *Spectrochim. Acta*, **48**, 397–402.

Wiedenbeck et al., 1995, *Geostand. Geoanal. Res.*, **19**, 1–23.

Table A2 The U–Pb zircon data in this study.

C (D):concordant (discordant) data.

| Sample | Th/U | $^{207}Pb/^{235}U$ | | Error 2SD | $^{206}Pb/^{238}U$ | | Error 2SD | $^{207}Pb/^{235}U$ (Ma) | | Error 2SD | $^{206}Pb/^{238}U$ (Ma) | | Error 2SD | memo | spot part |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91500-01 | 0.34 | 1.8447 | ± | 0.1270 | 0.17980 | ± | 0.00743 | 1061.5 | ± | 73.1 | 1065.9 | ± | 44.0 | C | |
| 91500-02 | 0.35 | 1.8894 | ± | 0.1245 | 0.18139 | ± | 0.00594 | 1077.3 | ± | 71.0 | 1074.5 | ± | 35.2 | C | |
| 91500-03 | 0.34 | 1.9208 | ± | 0.1089 | 0.18194 | ± | 0.00382 | 1088.3 | ± | 61.7 | 1077.6 | ± | 22.6 | C | |
| OD-3-01 | 1.24 | 0.0322 | ± | 0.0061 | 0.00504 | ± | 0.00027 | 32.2 | ± | 6.1 | 32.4 | ± | 1.7 | C | |
| OD-3-02 | 1.49 | 0.0359 | ± | 0.0057 | 0.00527 | ± | 0.00023 | 35.8 | ± | 5.7 | 33.9 | ± | 1.5 | C | |
| OD-3-03 | 1.23 | 0.0471 | ± | 0.0091 | 0.00558 | ± | 0.00026 | 46.8 | ± | 9.1 | 35.9 | ± | 1.6 | D | |
| MGD-02-01 | 1.11 | 0.1252 | ± | 0.0146 | 0.01703 | ± | 0.00077 | 119.8 | ± | 13.9 | 108.9 | ± | 4.9 | C | inner |
| MGD-02-02 | 0.58 | 0.1251 | ± | 0.0119 | 0.01876 | ± | 0.00080 | 119.7 | ± | 11.4 | 119.8 | ± | 5.1 | C | inner |
| MGD-02-03 | 0.63 | 0.1122 | ± | 0.0134 | 0.01673 | ± | 0.00075 | 108.0 | ± | 12.9 | 107.0 | ± | 4.8 | C | mantle |
| MGD-02-04 | 0.74 | 0.2493 | ± | 0.0239 | 0.01817 | ± | 0.00083 | 226.0 | ± | 21.6 | 116.1 | ± | 5.3 | D | inner |
| MGD-02-05 | 0.51 | 0.1062 | ± | 0.0177 | 0.01695 | ± | 0.00085 | 102.5 | ± | 17.1 | 108.3 | ± | 5.5 | C | mantle |
| MGD-02-06 | 0.51 | 0.1144 | ± | 0.0152 | 0.01756 | ± | 0.00082 | 110.0 | ± | 14.6 | 112.2 | ± | 5.2 | C | inner |
| MGD-02-07 | 0.51 | 0.1531 | ± | 0.0223 | 0.01704 | ± | 0.00087 | 144.6 | ± | 21.0 | 108.9 | ± | 5.6 | D | inner |
| MGD-02-08 | 0.72 | 0.1067 | ± | 0.0092 | 0.01645 | ± | 0.00069 | 103.0 | ± | 8.9 | 105.2 | ± | 4.4 | C | inner |
| MGD-02-09 | 0.81 | 0.1331 | ± | 0.0162 | 0.01849 | ± | 0.00072 | 126.9 | ± | 15.4 | 118.1 | ± | 4.6 | C | mantle |
| MGD-02-10 | 0.61 | 0.1366 | ± | 0.0162 | 0.01712 | ± | 0.00067 | 130.0 | ± | 15.4 | 109.4 | ± | 4.3 | D | inner |
| MGD-02-11 | 0.66 | 0.1411 | ± | 0.0171 | 0.01721 | ± | 0.00068 | 134.0 | ± | 16.3 | 110.0 | ± | 4.4 | D | inner |
| MGD-02-12 | 0.79 | 0.1087 | ± | 0.0148 | 0.01703 | ± | 0.00068 | 104.8 | ± | 14.3 | 108.8 | ± | 4.3 | C | mantle |
| MGD-02-13 | 0.64 | 0.1627 | ± | 0.0186 | 0.01747 | ± | 0.00069 | 153.1 | ± | 17.5 | 111.7 | ± | 4.4 | D | mantle |
| MGD-02-14 | 0.57 | 0.1553 | ± | 0.0184 | 0.01797 | ± | 0.00071 | 146.6 | ± | 17.4 | 114.8 | ± | 4.6 | D | inner |
| MGD-02-15 | 0.50 | 0.1536 | ± | 0.0246 | 0.01735 | ± | 0.00083 | 145.1 | ± | 23.3 | 110.9 | ± | 5.3 | D | outer |
| MGD-02-16 | 0.54 | 0.1053 | ± | 0.0147 | 0.01666 | ± | 0.00067 | 101.7 | ± | 14.2 | 106.5 | ± | 4.3 | C | inner |
| MGD-02-17 | 1.01 | 0.1431 | ± | 0.0120 | 0.01683 | ± | 0.00042 | 135.8 | ± | 11.4 | 107.6 | ± | 2.7 | D | inner |
| MGD-02-18 | 0.51 | 0.1245 | ± | 0.0167 | 0.01755 | ± | 0.00056 | 119.2 | ± | 16.0 | 112.1 | ± | 3.6 | C | outer |
| MGD-02-19 | 0.49 | 0.1206 | ± | 0.0178 | 0.01744 | ± | 0.00060 | 115.6 | ± | 17.0 | 111.4 | ± | 3.8 | C | outer |
| MGD-02-20 | 0.53 | 0.1468 | ± | 0.0178 | 0.01719 | ± | 0.00055 | 139.1 | ± | 16.9 | 109.9 | ± | 3.5 | D | outer |
| MGD-02-21 | 0.48 | 0.1147 | ± | 0.0161 | 0.01660 | ± | 0.00055 | 110.3 | ± | 15.5 | 106.2 | ± | 3.5 | C | outer |
| MGD-02-22 | 0.92 | 0.1160 | ± | 0.0083 | 0.01711 | ± | 0.00037 | 111.4 | ± | 8.0 | 109.4 | ± | 2.4 | C | inner |
| MGD-02-23 | 0.50 | 0.1465 | ± | 0.0200 | 0.01769 | ± | 0.00061 | 138.8 | ± | 18.9 | 113.1 | ± | 3.9 | D | inner |
| MGD-02-24 | 0.69 | 0.1099 | ± | 0.0116 | 0.01681 | ± | 0.00045 | 105.9 | ± | 11.1 | 107.5 | ± | 2.9 | C | inner |