

**Formation of Amphibole-Bearing Peridotite and Amphibole-Bearing Pyroxenite through
Hydrous Melt-Peridotite Reaction and In Situ Crystallization:
An Experimental Study**

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Introduction

This file includes figures and data supporting the main text:

- Figure S1 displays BSE images for BAH11;
- Figure S2-S3 show core-to-rim compositional variations in orthopyroxene, amphibole, and plagioclase grains;
- Figure S4-S8 plot olivine, clinopyroxene, and spinel compositions as a function of distance from the gabbro-norite-orthopyroxenite interface;
- Tables S1-S3 present electron microprobe data of experimental results.

Oxide abundances are in wt%, and distances are in μm ; Total Fe as FeO; NA = not analyzed; ND = not detected; X = distance from gabbro-norite-orthopyroxenite interface ($X > 0$ in the orthopyroxenite and peridotite regions, $X < 0$ in the gabbro-norite region); D = distance from the center of mineral grain. $\text{Mg\#} = 100 \times \text{Mg}/(\text{Mg} + \text{Fe})$, in molar; $\text{Cr\#} = 100 \times \text{Cr}/(\text{Cr} + \text{Al})$, in molar; $\text{An\#} = 100 \times \text{Ca}/(\text{Ca} + \text{Na})$, in molar.

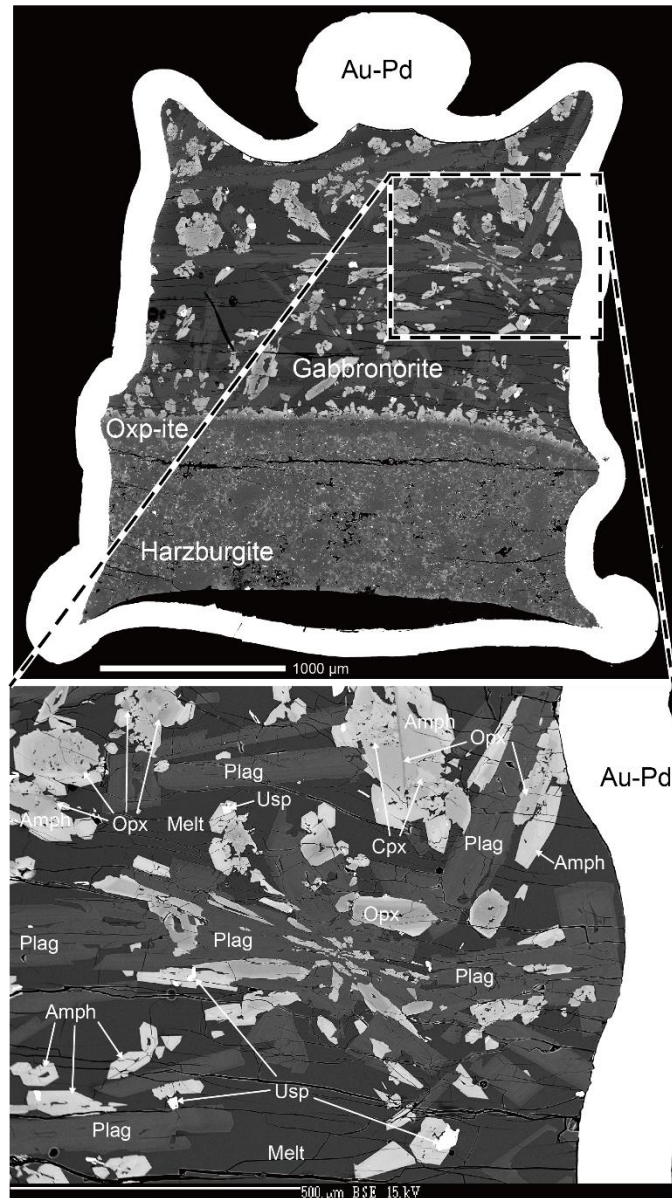


Figure S1. BSE images showing the experimental charge (upper) and a close-up view of the gabbro-norite region (lower) of BAH11 (hydrous basaltic andesite vs. lherzolite, 3 h reaction). Oxp-ite = orthopyroxenite; Opx = orthopyroxene; Cpx = clinopyroxene; Amph = amphibole; Plag = plagioclase; Usp = Ulvöspinel.

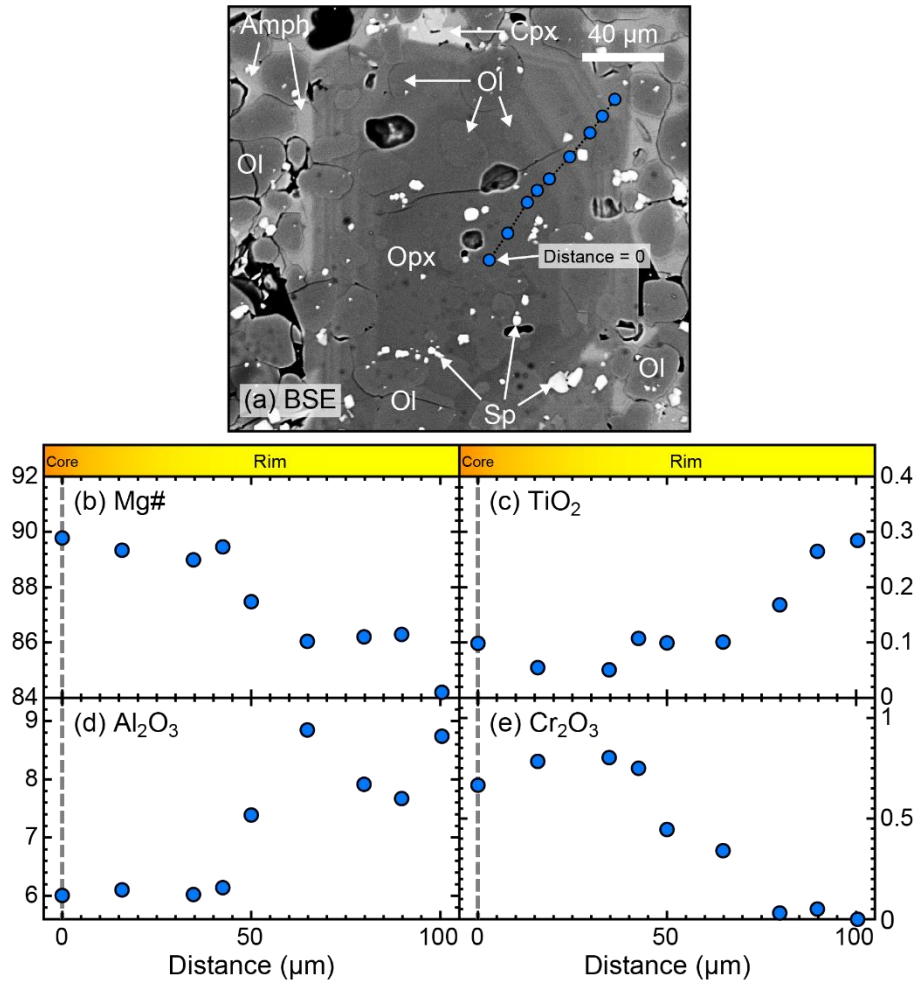


Figure S2. BSE image and electron microprobe data showing the chemical zoning of an orthopyroxene grain. (a) Core-to-rim zoned orthopyroxene in peridotite from BAH13. (b-e) Variations of Mg# and oxide abundances (in wt%) in orthopyroxene as a function of distance from the orthopyroxene core. Blue circles in (a) mark positions of the probe analyses plotted in (b-e).

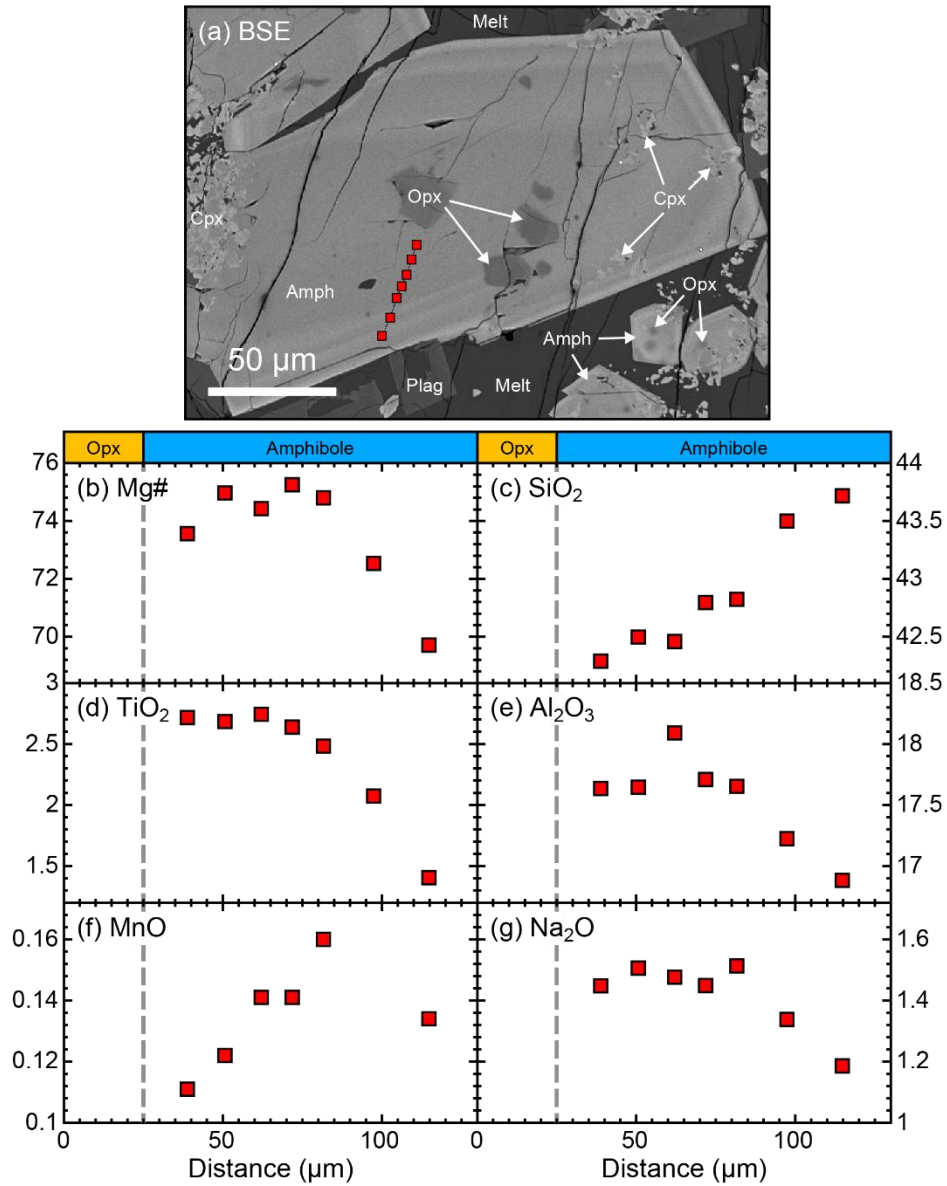


Figure S3. BSE image and electron microprobe data showing the chemical zoning of an amphibole grain. (a) Core-to-rim zoned amphibole in peridotite from MBH12. (b-g) Variations of Mg# and oxide abundances (in wt%) in amphibole as a function of distance from the amphibole core. Red squares in (a) mark positions of the probe analyses plotted in (b-g). Vertical dashed red lines in (b-g) mark the position of orthopyroxene-amphibole boundary. Note inclusions of orthopyroxenes in amphiboles.

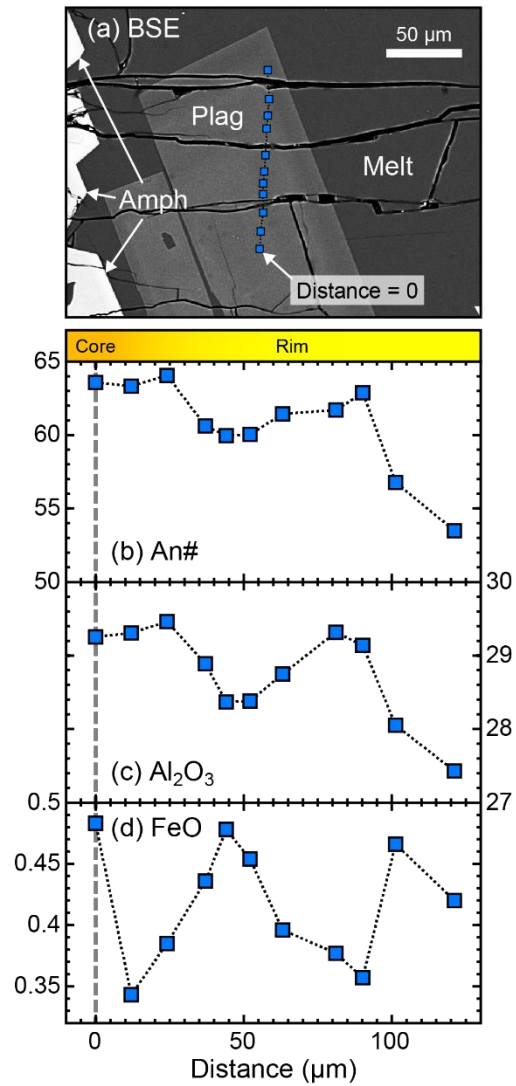


Figure S4. BSE image and electron microprobe data showing the chemical zoning of plagioclase grain. (a) Core-to-rim zoned plagioclase in amphibole gabbro from BAH13. (b-d) Variations of An# and oxide abundances (in wt%) in plagioclase as a function of distance from the plagioclase core. Blue squares in (a) mark positions of the probe analyses plotted in (b-d).

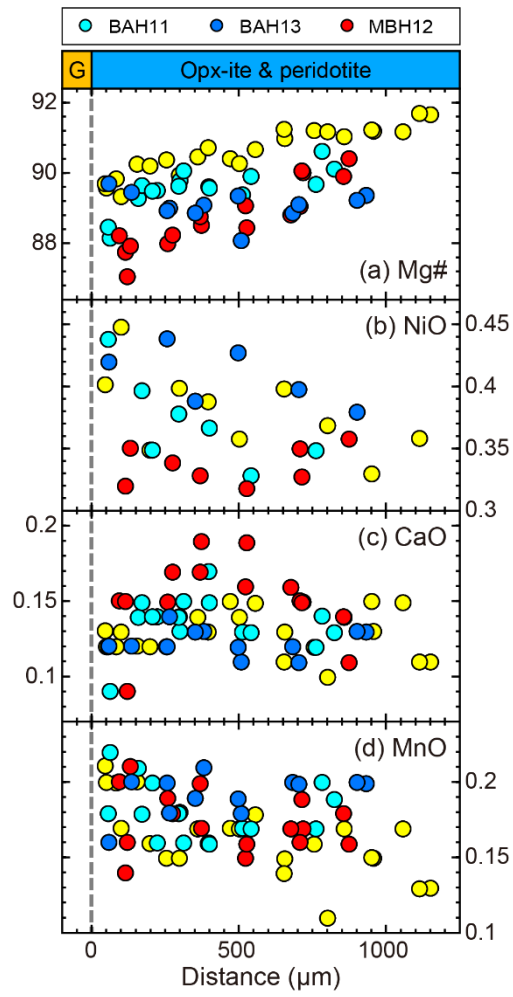


Figure S5. Plots of Mg# and oxide abundances (in wt%) in olivine as a function of distance from the gabbro-norite-orthopyroxenite interface (dashed lines). Cyan, blue, red, and yellow circles are data from BAH11, BAH13, BAH12, and BAH8 (Wang et al. 2016), respectively.

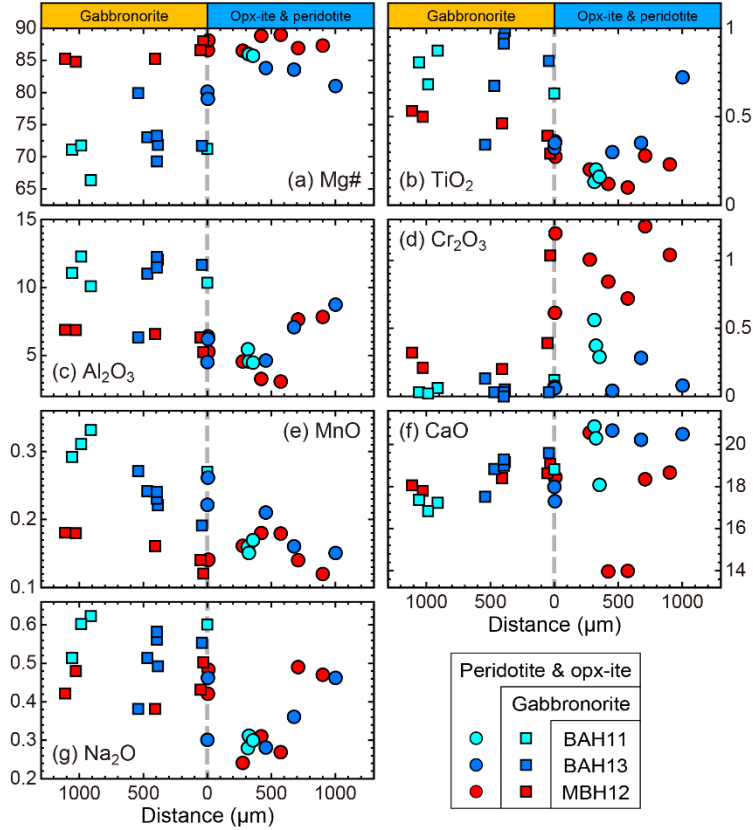


Figure S6. Plots of Mg# and oxide abundances (in wt%) in clinopyroxene as a function of distance from the gabbro-norite-orthopyroxenite interface (dashed lines). Circles represent clinopyroxene in the orthopyroxenite and peridotite regions, and squares represent those in the gabbro-norite regions.

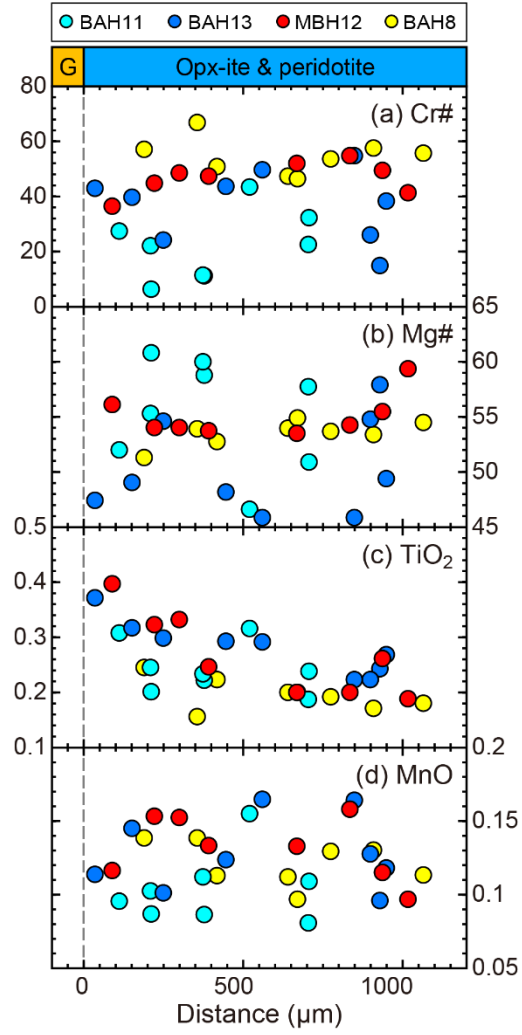


Figure S7. Plots of Cr#, Mg#, and oxide abundances (in wt%) in spinel as a function of distance from the gabbro-norite-orthopyroxenite interface (dashed lines).

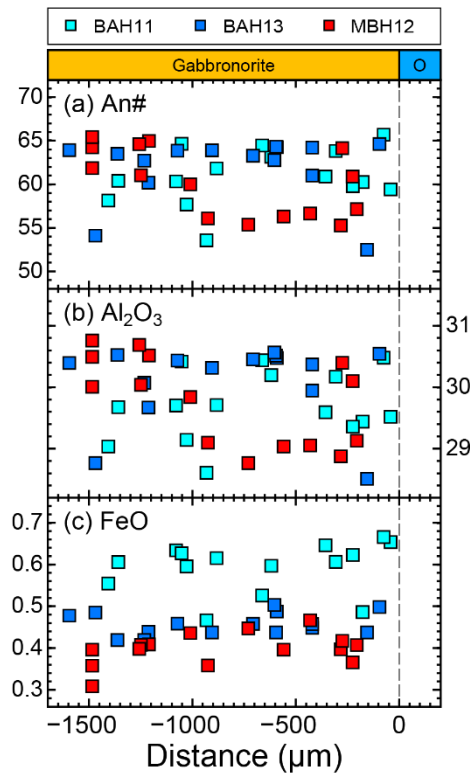


Figure S8. Plots of An# and oxide abundances (in wt%) in plagioclase as a function of distance from the gabbro-norite-orthopyroxenite interface (dashed lines).

Table S1-1. Electron microprobe data of amphibole in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|-------|-------------------|-------|-------|-------|
| 42.11 | 1.93 | 13.14 | 0.05 | 16.68 | 0.37 | 10.79 | 10.55 | 1.74 | 97.36 | 53.56 | 4 |
| 42.00 | 2.36 | 13.61 | 0.00 | 17.05 | 0.39 | 10.71 | 9.93 | 1.78 | 97.83 | 52.82 | -40 |
| 39.97 | 3.74 | 14.37 | 0.02 | 18.28 | 0.39 | 9.70 | 9.34 | 2.16 | 97.96 | 48.61 | -5 |
| 41.67 | 1.47 | 16.78 | 0.05 | 7.21 | 0.10 | 17.10 | 10.46 | 2.79 | 97.63 | 80.87 | 127 |
| 42.75 | 0.83 | 15.87 | 0.04 | 6.96 | 0.08 | 17.65 | 10.90 | 2.66 | 97.73 | 81.89 | 197 |
| 44.10 | 0.47 | 15.31 | 0.04 | 7.15 | 0.12 | 18.04 | 10.68 | 2.38 | 98.27 | 81.81 | 298 |
| 42.48 | 1.19 | 15.63 | 0.14 | 6.80 | 0.10 | 17.51 | 10.82 | 2.67 | 97.34 | 82.11 | 402 |
| 44.49 | 0.37 | 14.28 | 0.31 | 6.63 | 0.14 | 18.53 | 10.76 | 2.30 | 97.79 | 83.28 | 843 |
| 40.14 | 3.38 | 14.01 | 0.00 | 18.23 | 0.40 | 9.27 | 9.80 | 1.93 | 97.17 | 47.55 | -300 |
| 40.35 | 3.31 | 14.04 | 0.00 | 18.33 | 0.43 | 9.37 | 9.55 | 2.03 | 97.40 | 47.68 | -924 |
| 39.83 | 3.14 | 15.02 | 0.01 | 18.47 | 0.41 | 8.97 | 9.33 | 1.83 | 97.02 | 46.40 | -1007 |

Table S1-2. Electron microprobe data of olivine in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | NiO | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------------------|------|--------|-------|-----|
| 40.34 | 0.02 | 0.05 | 0.05 | 11.41 | 0.22 | 47.60 | 0.09 | ND | NA | 99.76 | 88.15 | 62 |
| 40.56 | 0.01 | 0.04 | 0.06 | 10.43 | 0.21 | 48.71 | 0.14 | ND | NA | 100.18 | 89.28 | 160 |
| 40.68 | 0.01 | 0.06 | 0.04 | 10.19 | 0.16 | 48.71 | 0.14 | ND | NA | 99.99 | 89.50 | 223 |
| 40.46 | 0.01 | 0.03 | 0.05 | 9.93 | 0.18 | 48.89 | 0.13 | 0.01 | NA | 99.69 | 89.77 | 300 |
| 40.66 | ND | 0.13 | 0.06 | 9.63 | 0.16 | 48.96 | 0.15 | 0.04 | NA | 99.79 | 90.06 | 313 |
| 40.53 | ND | 0.08 | 0.05 | 10.08 | 0.16 | 48.76 | 0.17 | ND | NA | 99.83 | 89.61 | 397 |
| 40.43 | 0.01 | 0.04 | 0.06 | 10.33 | 0.17 | 48.81 | 0.13 | 0.02 | NA | 100.00 | 89.39 | 512 |
| 40.65 | ND | 0.04 | 0.05 | 9.15 | 0.20 | 49.58 | 0.14 | ND | NA | 99.82 | 90.62 | 782 |
| 40.86 | 0.01 | 0.03 | 0.05 | 9.68 | 0.19 | 49.50 | 0.13 | ND | NA | 100.44 | 90.11 | 825 |
| 40.65 | ND | 0.06 | 0.03 | 11.12 | 0.18 | 47.84 | 0.12 | ND | 0.44 | 100.45 | 88.46 | 58 |
| 40.89 | 0.01 | 0.03 | 0.07 | 10.09 | 0.18 | 48.99 | 0.15 | ND | 0.40 | 100.81 | 89.64 | 172 |
| 40.76 | 0.01 | 0.03 | 0.05 | 10.19 | 0.20 | 48.61 | 0.14 | 0.01 | 0.35 | 100.35 | 89.48 | 206 |
| 40.74 | ND | 0.05 | 0.03 | 10.11 | 0.18 | 48.98 | 0.14 | ND | 0.38 | 100.62 | 89.62 | 297 |
| 40.92 | 0.01 | 0.02 | 0.07 | 10.17 | 0.16 | 49.05 | 0.15 | ND | 0.37 | 100.91 | 89.58 | 400 |
| 40.88 | 0.01 | 0.06 | 0.08 | 9.85 | 0.17 | 49.17 | 0.13 | 0.01 | 0.33 | 100.68 | 89.90 | 542 |
| 40.78 | 0.01 | 0.03 | 0.05 | 10.06 | 0.17 | 48.98 | 0.12 | ND | 0.35 | 100.55 | 89.67 | 763 |

Table S1-3. Electron microprobe data of orthopyroxene in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------------------|--------|-------|-------|
| 48.53 | 0.20 | 10.72 | 0.06 | 14.66 | 0.33 | 24.37 | 1.35 | 0.05 | 100.28 | 74.77 | 29 |
| 50.94 | 0.13 | 7.34 | 1.00 | 11.14 | 0.29 | 27.79 | 1.42 | 0.05 | 100.10 | 81.64 | 42 |
| 52.46 | 0.10 | 6.78 | 0.78 | 7.90 | 0.19 | 31.03 | 1.17 | 0.03 | 100.45 | 87.50 | 60 |
| 52.16 | 0.09 | 7.11 | 0.84 | 7.89 | 0.19 | 30.84 | 1.24 | 0.05 | 100.41 | 87.45 | 83 |
| 54.93 | 0.06 | 3.43 | 0.36 | 7.17 | 0.18 | 32.30 | 1.63 | 0.04 | 100.11 | 88.93 | 103 |
| 52.69 | 0.14 | 3.57 | 0.04 | 14.63 | 0.40 | 26.52 | 1.50 | 0.04 | 99.54 | 76.37 | 1 |
| 52.56 | 0.14 | 4.78 | 0.10 | 13.33 | 0.35 | 26.99 | 1.94 | 0.09 | 100.27 | 78.30 | 21 |
| 53.59 | 0.08 | 4.08 | 0.58 | 10.54 | 0.29 | 29.45 | 1.41 | 0.05 | 100.07 | 83.28 | 40 |
| 52.77 | 0.10 | 6.38 | 0.72 | 7.59 | 0.18 | 31.09 | 1.39 | 0.04 | 100.27 | 87.95 | 94 |
| 54.96 | 0.05 | 3.46 | 0.28 | 7.25 | 0.18 | 32.23 | 1.82 | 0.06 | 100.30 | 88.79 | 99 |
| 55.44 | 0.05 | 2.70 | 0.57 | 6.49 | 0.18 | 32.98 | 1.65 | 0.05 | 100.10 | 90.06 | 485 |
| 54.38 | 0.09 | 4.28 | 0.09 | 7.73 | 0.18 | 32.09 | 1.39 | 0.03 | 100.24 | 88.10 | 472 |
| 51.80 | 0.07 | 6.50 | 0.25 | 8.52 | 0.24 | 31.36 | 1.11 | 0.01 | 99.86 | 86.77 | 470 |
| 51.82 | 0.12 | 7.44 | 0.23 | 8.23 | 0.19 | 30.46 | 1.75 | 0.04 | 100.27 | 86.84 | 781 |
| 48.05 | 0.35 | 10.30 | 0.05 | 15.96 | 0.35 | 23.40 | 1.47 | 0.10 | 100.02 | 72.33 | -202 |
| 48.44 | 0.38 | 7.63 | 0.05 | 18.43 | 0.48 | 21.85 | 2.11 | 0.04 | 99.41 | 67.88 | -264 |
| 46.78 | 0.35 | 12.00 | 0.02 | 17.18 | 0.42 | 22.05 | 1.56 | 0.10 | 100.46 | 69.58 | -875 |
| 49.05 | 0.26 | 9.05 | 0.06 | 14.74 | 0.38 | 24.20 | 1.99 | 0.09 | 99.80 | 74.53 | -1003 |

Table S1-4. Electron microprobe data of clinopyroxene in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|-------|-------------------|-------|-------|-------|
| 46.82 | 0.63 | 10.34 | 0.12 | 9.33 | 0.27 | 12.96 | 18.80 | 0.60 | 99.86 | 71.23 | 18 |
| 50.63 | 0.13 | 5.45 | 0.56 | 4.91 | 0.16 | 16.97 | 20.85 | 0.28 | 99.94 | 86.04 | 335 |
| 51.18 | 0.20 | 4.53 | 0.37 | 5.11 | 0.15 | 17.51 | 20.20 | 0.31 | 99.55 | 85.93 | 346 |
| 51.81 | 0.16 | 4.47 | 0.29 | 5.64 | 0.17 | 19.05 | 18.06 | 0.30 | 99.95 | 85.76 | 375 |
| 46.31 | 0.68 | 12.23 | 0.02 | 9.39 | 0.31 | 13.39 | 16.78 | 0.60 | 99.69 | 71.77 | -966 |
| 46.38 | 0.87 | 10.04 | 0.06 | 11.44 | 0.33 | 12.67 | 17.15 | 0.62 | 99.55 | 66.38 | -891 |
| 46.35 | 0.80 | 10.99 | 0.03 | 9.67 | 0.29 | 13.36 | 17.23 | 0.51 | 99.24 | 71.12 | -1037 |

Table S1-5. Electron microprobe data of spinel in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Total | Mg# | Cr# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------|-------|-------|-------|
| 0.13 | 12.35 | 5.12 | 0.07 | 76.17 | 0.27 | 1.38 | 0.07 | 95.56 | 3.14 | 0.91 | -789 |
| 0.11 | 10.52 | 6.01 | 0.02 | 76.00 | 0.25 | 1.45 | 0.05 | 94.40 | 3.28 | 0.22 | -1324 |
| 0.12 | 9.75 | 7.32 | 0.05 | 75.93 | 0.23 | 1.60 | 0.07 | 95.07 | 3.62 | 0.46 | -577 |
| 0.11 | 10.37 | 6.65 | 0.03 | 76.32 | 0.23 | 1.58 | 0.05 | 95.34 | 3.56 | 0.30 | -367 |
| 0.11 | 11.64 | 5.26 | 0.07 | 77.34 | 0.27 | 1.37 | 0.07 | 96.14 | 3.07 | 0.89 | -322 |
| 0.13 | 9.22 | 8.02 | 0.02 | 75.98 | 0.22 | 1.66 | 0.06 | 95.30 | 3.75 | 0.17 | -75 |
| 0.17 | 10.25 | 6.00 | 0.03 | 75.96 | 0.22 | 1.49 | 0.10 | 94.22 | 3.37 | 0.34 | -6 |
| 0.12 | 0.31 | 36.70 | 20.55 | 25.87 | 0.10 | 15.73 | 0.11 | 99.49 | 52.01 | 27.31 | 112 |
| 0.12 | 0.24 | 39.77 | 16.75 | 24.06 | 0.10 | 16.72 | 0.15 | 97.91 | 55.33 | 22.03 | 210 |
| 0.17 | 0.20 | 52.92 | 5.28 | 21.01 | 0.09 | 18.30 | 0.10 | 98.06 | 60.82 | 6.28 | 212 |
| 0.24 | 0.22 | 49.16 | 9.34 | 22.00 | 0.09 | 17.60 | 0.14 | 98.78 | 58.78 | 11.30 | 377 |
| 0.13 | 0.23 | 47.68 | 9.19 | 22.21 | 0.11 | 18.68 | 0.07 | 98.30 | 59.98 | 11.45 | 373 |
| 0.13 | 0.31 | 26.32 | 30.04 | 26.84 | 0.15 | 13.15 | 0.05 | 96.98 | 46.61 | 43.37 | 520 |
| 0.13 | 0.23 | 33.12 | 23.52 | 24.75 | 0.11 | 14.40 | 0.13 | 96.39 | 50.92 | 32.27 | 706 |
| 0.11 | 0.19 | 41.03 | 17.75 | 22.56 | 0.08 | 17.30 | 0.11 | 99.12 | 57.74 | 22.49 | 704 |

Table S1-6. Electron microprobe data of plagioclase in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | FeO | MgO | CaO | Na ₂ O | K ₂ O | Total | An | X |
|------------------|------------------|--------------------------------|------|------|-------|-------------------|------------------|--------|-------|-------|
| 53.99 | 0.04 | 29.66 | 0.49 | 0.11 | 12.02 | 4.29 | 0.14 | 100.75 | 60.76 | -177 |
| 53.94 | 0.02 | 29.69 | 0.63 | 0.09 | 12.19 | 4.43 | 0.15 | 101.13 | 60.33 | -224 |
| 53.81 | 0.03 | 29.80 | 0.66 | 0.11 | 11.97 | 4.42 | 0.15 | 100.95 | 59.95 | -41 |
| 52.30 | 0.04 | 30.67 | 0.67 | 0.08 | 13.06 | 3.69 | 0.12 | 100.62 | 66.17 | -75 |
| 52.93 | 0.01 | 30.35 | 0.61 | 0.09 | 12.60 | 3.86 | 0.13 | 100.59 | 64.34 | -307 |
| 53.63 | 0.03 | 29.77 | 0.65 | 0.05 | 12.12 | 4.21 | 0.14 | 100.60 | 61.40 | -357 |
| 52.82 | 0.01 | 30.36 | 0.60 | 0.07 | 12.58 | 3.97 | 0.13 | 100.54 | 63.65 | -619 |
| 52.63 | 0.05 | 30.69 | 0.53 | 0.06 | 12.90 | 3.86 | 0.11 | 100.82 | 64.87 | -663 |
| 53.70 | 0.01 | 29.92 | 0.62 | 0.09 | 12.16 | 4.05 | 0.15 | 100.71 | 62.40 | -883 |
| 55.48 | 0.02 | 28.82 | 0.47 | 0.02 | 10.73 | 5.01 | 0.20 | 100.74 | 54.20 | -932 |
| 54.17 | 0.05 | 29.38 | 0.60 | 0.09 | 11.71 | 4.65 | 0.15 | 100.81 | 58.19 | -1029 |
| 53.72 | 0.04 | 29.99 | 0.64 | 0.04 | 12.08 | 4.29 | 0.15 | 100.96 | 60.88 | -1079 |
| 52.37 | 0.01 | 30.56 | 0.63 | 0.05 | 12.90 | 3.82 | 0.12 | 100.47 | 65.11 | -1052 |
| 54.29 | 0.02 | 29.32 | 0.56 | 0.15 | 11.86 | 4.62 | 0.15 | 100.98 | 58.65 | -1407 |
| 53.54 | 0.03 | 29.88 | 0.61 | 0.08 | 12.11 | 4.29 | 0.15 | 100.69 | 60.94 | -1359 |

Table S1-7. Electron microprobe data of melt in BAH11

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | K ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|------|------|------|------|-------------------|------------------|-------|-------|-------|
| 65.24 | 0.32 | 15.56 | 0.07 | 3.46 | 0.12 | 0.79 | 4.31 | 1.97 | 1.18 | 93.03 | 28.93 | -36 |
| 64.64 | 0.39 | 15.77 | 0.05 | 3.50 | 0.16 | 0.80 | 4.53 | 2.28 | 1.29 | 93.49 | 28.95 | -236 |
| 64.87 | 0.37 | 15.71 | 0.13 | 3.61 | 0.18 | 0.81 | 4.43 | 2.45 | 1.37 | 93.98 | 28.57 | -397 |
| 64.99 | 0.36 | 15.63 | 0.05 | 3.52 | 0.12 | 0.80 | 4.35 | 2.39 | 1.31 | 93.51 | 28.83 | -645 |
| 64.62 | 0.44 | 15.54 | 0.03 | 3.38 | 0.13 | 0.81 | 4.50 | 1.99 | 1.29 | 92.76 | 29.93 | -693 |
| 63.81 | 0.56 | 16.09 | 0.00 | 3.48 | 0.12 | 0.80 | 4.60 | 2.22 | 1.28 | 92.95 | 29.07 | -651 |
| 63.78 | 0.43 | 16.19 | 0.10 | 3.38 | 0.19 | 0.83 | 4.66 | 2.45 | 1.32 | 93.40 | 30.45 | -389 |
| 64.22 | 0.44 | 15.70 | 0.04 | 3.47 | 0.14 | 0.81 | 4.56 | 2.42 | 1.31 | 93.11 | 29.38 | -622 |
| 64.89 | 0.38 | 15.68 | 0.02 | 3.22 | 0.15 | 0.84 | 4.51 | 2.53 | 1.24 | 93.48 | 31.74 | -82 |
| 63.93 | 0.49 | 15.85 | 0.25 | 3.46 | 0.17 | 0.80 | 4.61 | 2.39 | 1.30 | 93.24 | 29.19 | -494 |
| 64.94 | 0.39 | 15.48 | 0.19 | 3.60 | 0.15 | 0.76 | 4.43 | 2.45 | 1.30 | 93.75 | 27.34 | -956 |
| 64.59 | 0.45 | 15.72 | 0.00 | 3.61 | 0.14 | 0.78 | 4.47 | 2.09 | 1.28 | 93.17 | 27.81 | -1057 |
| 64.89 | 0.34 | 15.72 | 0.00 | 3.53 | 0.15 | 0.82 | 4.36 | 3.08 | 1.37 | 94.25 | 29.28 | -1032 |

Table S2-1. Electron microprobe data of amphibole in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|-------|-------------------|-------|-------|------|
| 41.30 | 2.42 | 14.63 | 0.02 | 13.59 | 0.22 | 12.79 | 10.54 | 2.21 | 97.71 | 62.65 | -395 |
| 40.73 | 2.34 | 15.23 | 0.01 | 13.79 | 0.23 | 12.65 | 10.27 | 2.34 | 97.58 | 62.05 | -380 |
| 40.28 | 2.38 | 15.79 | 0.00 | 14.05 | 0.21 | 12.22 | 10.17 | 2.26 | 97.36 | 60.79 | -385 |
| 39.10 | 2.30 | 17.89 | 0.01 | 13.63 | 0.21 | 11.76 | 10.26 | 2.25 | 97.42 | 60.60 | -36 |
| 39.68 | 2.10 | 17.31 | 0.01 | 13.55 | 0.22 | 12.12 | 10.33 | 2.43 | 97.76 | 61.46 | -127 |
| 41.53 | 1.80 | 16.41 | 0.02 | 7.95 | 0.14 | 16.36 | 10.59 | 2.46 | 97.26 | 78.58 | 194 |
| 43.10 | 0.54 | 15.75 | 0.12 | 7.25 | 0.16 | 17.35 | 10.88 | 2.24 | 97.40 | 81.01 | 436 |
| 44.33 | 0.54 | 13.94 | 0.26 | 7.28 | 0.15 | 18.16 | 10.47 | 2.05 | 97.18 | 81.64 | 701 |
| 42.40 | 1.59 | 16.12 | 0.05 | 7.75 | 0.14 | 17.04 | 10.13 | 2.52 | 97.75 | 79.67 | 956 |

Table S2-2. Electron microprobe data of olivine in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | NiO | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------------------|------|--------|-------|-----|
| 40.60 | 0.00 | 0.01 | 0.06 | 10.18 | 0.20 | 48.42 | 0.12 | ND | NA | 99.60 | 89.45 | 136 |
| 40.69 | 0.02 | 0.02 | 0.06 | 10.32 | 0.20 | 48.67 | 0.13 | ND | NA | 100.09 | 89.37 | 933 |
| 40.53 | 0.01 | 0.02 | 0.06 | 10.76 | 0.20 | 48.11 | 0.12 | 0.02 | NA | 99.84 | 88.85 | 684 |
| 40.49 | ND | 0.02 | 0.04 | 11.52 | 0.18 | 47.75 | 0.11 | 0.04 | NA | 100.15 | 88.08 | 508 |
| 40.59 | 0.01 | 0.03 | 0.05 | 10.55 | 0.21 | 48.33 | 0.13 | 0.01 | NA | 99.91 | 89.09 | 383 |
| 40.60 | ND | 0.02 | 0.05 | 10.65 | 0.18 | 48.31 | 0.14 | ND | NA | 99.94 | 88.99 | 266 |
| 40.58 | 0.01 | 0.01 | 0.05 | 10.43 | 0.20 | 48.45 | 0.13 | ND | 0.38 | 100.24 | 89.22 | 902 |
| 40.76 | ND | ND | 0.06 | 10.60 | 0.20 | 48.58 | 0.11 | ND | 0.40 | 100.72 | 89.09 | 705 |
| 40.67 | ND | ND | 0.06 | 10.38 | 0.19 | 48.85 | 0.12 | ND | 0.43 | 100.70 | 89.35 | 499 |
| 40.71 | ND | 0.02 | 0.07 | 10.78 | 0.19 | 48.23 | 0.13 | ND | 0.39 | 100.52 | 88.86 | 352 |
| 40.60 | 0.01 | 0.03 | 0.05 | 10.69 | 0.20 | 48.20 | 0.12 | ND | 0.44 | 100.35 | 88.93 | 258 |
| 40.74 | ND | 0.01 | 0.07 | 9.96 | 0.16 | 48.60 | 0.12 | 0.01 | 0.42 | 100.07 | 89.69 | 59 |

Table S2-3. Electron microprobe data of orthopyroxene in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X | Comment |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------------------|--------|-------|------|---------|
| 51.77 | 0.15 | 7.31 | 0.34 | 10.11 | 0.26 | 28.68 | 1.67 | 0.03 | 100.30 | 83.49 | -330 | Core |
| 51.30 | 0.18 | 7.81 | 0.26 | 10.21 | 0.27 | 28.43 | 1.77 | 0.04 | 100.26 | 83.23 | -295 | Core |
| 51.81 | 0.16 | 7.04 | 0.23 | 10.35 | 0.28 | 28.74 | 1.62 | 0.08 | 100.32 | 83.19 | -380 | Core |
| 51.85 | 0.16 | 6.78 | 0.20 | 10.24 | 0.26 | 28.95 | 1.63 | 0.05 | 100.12 | 83.44 | -325 | Core |
| 55.51 | 0.06 | 3.12 | 0.44 | 7.08 | 0.20 | 32.81 | 1.16 | ND | 100.37 | 89.20 | 126 | Core |
| 55.49 | 0.06 | 3.03 | 0.43 | 7.01 | 0.19 | 32.80 | 1.16 | 0.02 | 100.21 | 89.29 | 145 | Core |
| 55.48 | 0.06 | 3.18 | 0.43 | 6.92 | 0.18 | 32.82 | 1.15 | 0.02 | 100.25 | 89.42 | 125 | Core |
| 52.39 | 0.13 | 6.19 | 0.87 | 9.07 | 0.25 | 29.79 | 1.41 | 0.07 | 100.17 | 85.41 | 40 | Rim |
| 54.91 | 0.08 | 3.08 | 0.52 | 8.51 | 0.22 | 31.44 | 1.39 | 0.07 | 100.22 | 86.82 | 29 | Rim |
| 54.51 | 0.10 | 3.56 | 0.26 | 8.94 | 0.26 | 30.50 | 1.64 | 0.06 | 99.84 | 85.88 | 8 | Rim |
| 53.47 | 0.07 | 5.65 | 0.79 | 7.10 | 0.16 | 31.82 | 1.36 | 0.05 | 100.48 | 88.88 | 913 | Core |
| 52.40 | 0.11 | 7.11 | 0.52 | 8.11 | 0.17 | 30.87 | 1.31 | 0.01 | 100.60 | 87.15 | 911 | Rim |
| 52.69 | 0.07 | 6.48 | 0.97 | 7.17 | 0.17 | 31.31 | 1.19 | 0.04 | 100.07 | 88.62 | 580 | Core |
| 52.00 | 0.16 | 7.49 | 0.19 | 8.51 | 0.20 | 30.21 | 1.49 | 0.05 | 100.31 | 86.35 | 623 | Rim |
| 52.41 | 0.12 | 6.77 | 0.50 | 7.76 | 0.20 | 30.83 | 1.29 | 0.03 | 99.93 | 87.63 | 624 | Rim |
| 53.30 | 0.09 | 5.47 | 0.79 | 7.19 | 0.20 | 31.66 | 1.18 | 0.02 | 99.90 | 88.70 | 624 | Core |

Table S2-4. Electron microprobe data of clinopyroxene in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|------|------|-------|-------|-------------------|-------|-------|------|
| 50.22 | 0.34 | 6.30 | 0.13 | 7.58 | 0.27 | 16.93 | 17.44 | 0.38 | 99.59 | 79.93 | -541 |
| 45.51 | 0.98 | 11.98 | 0.05 | 8.73 | 0.22 | 12.51 | 19.07 | 0.49 | 99.54 | 71.87 | -387 |
| 46.33 | 0.67 | 10.94 | 0.03 | 8.67 | 0.24 | 13.19 | 18.70 | 0.51 | 99.28 | 73.06 | -470 |
| 46.15 | 0.94 | 11.44 | 0.03 | 8.44 | 0.23 | 12.98 | 18.94 | 0.56 | 99.71 | 73.27 | -395 |
| 45.27 | 0.91 | 12.21 | ND | 9.39 | 0.24 | 11.88 | 19.23 | 0.58 | 99.71 | 69.28 | -395 |
| 51.31 | 0.32 | 4.51 | 0.07 | 7.62 | 0.22 | 17.23 | 17.88 | 0.30 | 99.45 | 80.12 | -48 |
| 50.21 | 0.35 | 6.18 | 0.06 | 7.92 | 0.26 | 16.74 | 17.19 | 0.46 | 99.38 | 79.03 | -12 |
| 45.66 | 0.81 | 11.60 | 0.03 | 8.70 | 0.19 | 12.38 | 19.47 | 0.55 | 99.39 | 71.72 | -43 |
| 51.16 | 0.30 | 4.61 | 0.04 | 5.77 | 0.21 | 16.77 | 20.62 | 0.28 | 99.77 | 83.82 | 456 |
| 49.43 | 0.35 | 7.06 | 0.28 | 5.66 | 0.16 | 16.11 | 20.12 | 0.36 | 99.53 | 83.54 | 676 |
| 47.86 | 0.72 | 8.69 | 0.08 | 6.21 | 0.15 | 14.86 | 20.38 | 0.46 | 99.42 | 81.01 | 1001 |

Table S2-5. Electron microprobe data of spinel in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Total | Mg# | Cr# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------|-------|-------|-----|
| 0.20 | 0.36 | 26.85 | 30.22 | 26.05 | 0.11 | 13.20 | 0.03 | 96.28 | 47.45 | 43.02 | 36 |
| 0.14 | 0.31 | 28.57 | 28.03 | 25.55 | 0.14 | 13.81 | 0.08 | 95.88 | 49.06 | 39.70 | 151 |
| 0.12 | 0.29 | 39.15 | 18.65 | 24.15 | 0.10 | 16.32 | 0.08 | 97.93 | 54.64 | 24.22 | 250 |
| 0.13 | 0.28 | 26.70 | 30.88 | 25.65 | 0.12 | 13.38 | 0.17 | 96.58 | 48.19 | 43.68 | 446 |
| 0.10 | 0.28 | 23.39 | 34.41 | 26.36 | 0.16 | 12.52 | 0.15 | 96.72 | 45.84 | 49.67 | 561 |
| 0.09 | 0.22 | 21.14 | 37.97 | 25.76 | 0.16 | 12.25 | 0.09 | 97.04 | 45.87 | 54.65 | 848 |
| 0.97 | 0.24 | 46.74 | 12.18 | 22.41 | 0.10 | 17.29 | 0.16 | 99.06 | 57.89 | 14.89 | 928 |
| 0.35 | 0.26 | 29.74 | 27.51 | 25.76 | 0.12 | 14.10 | 0.09 | 97.15 | 49.38 | 38.29 | 950 |
| 0.12 | 0.22 | 38.47 | 20.06 | 23.23 | 0.13 | 15.78 | 0.11 | 97.22 | 54.77 | 25.92 | 900 |

Table S2-6. Electron microprobe data of plagioclase in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | FeO | MgO | CaO | Na ₂ O | K ₂ O | Total | An | X |
|------------------|------------------|--------------------------------|------|------|-------|-------------------|------------------|--------|-------|-------|
| 52.23 | 0.01 | 30.67 | 0.50 | 0.06 | 12.97 | 3.84 | 0.13 | 100.41 | 65.11 | -96 |
| 55.42 | 0.01 | 28.68 | 0.44 | 0.03 | 10.65 | 5.23 | 0.15 | 100.60 | 52.95 | -156 |
| 52.79 | 0.02 | 30.49 | 0.45 | 0.06 | 12.65 | 3.81 | 0.13 | 100.39 | 64.72 | -421 |
| 53.19 | 0.04 | 30.11 | 0.46 | 0.04 | 12.31 | 4.27 | 0.12 | 100.55 | 61.44 | -421 |
| 52.62 | 0.03 | 30.64 | 0.49 | 0.08 | 12.73 | 3.84 | 0.11 | 100.54 | 64.69 | -593 |
| 52.12 | 0.04 | 30.69 | 0.44 | 0.07 | 13.15 | 3.96 | 0.11 | 100.58 | 64.73 | -596 |
| 52.35 | 0.02 | 30.97 | 0.51 | 0.05 | 13.09 | 4.22 | 0.11 | 101.32 | 63.16 | -604 |
| 53.52 | 0.02 | 29.74 | 0.44 | 0.08 | 12.00 | 4.31 | 0.12 | 100.24 | 60.61 | -1213 |
| 52.19 | 0.02 | 30.58 | 0.42 | 0.03 | 12.83 | 4.01 | 0.10 | 100.18 | 63.87 | -1364 |
| 54.94 | 0.04 | 29.07 | 0.49 | 0.03 | 11.19 | 5.14 | 0.16 | 101.06 | 54.61 | -1470 |
| 52.66 | 0.01 | 30.54 | 0.48 | 0.08 | 12.71 | 3.89 | 0.11 | 100.48 | 64.36 | -1596 |
| 53.02 | 0.04 | 30.14 | 0.42 | 0.08 | 12.41 | 3.99 | 0.13 | 100.22 | 63.22 | -1233 |
| 52.66 | 0.03 | 30.54 | 0.46 | 0.07 | 12.60 | 3.87 | 0.11 | 100.34 | 64.28 | -1073 |
| 52.65 | 0.04 | 30.49 | 0.44 | 0.05 | 12.85 | 3.94 | 0.11 | 100.58 | 64.32 | -906 |
| 52.30 | 0.02 | 30.60 | 0.46 | 0.08 | 12.87 | 4.05 | 0.12 | 100.49 | 63.72 | -708 |

Table S2-7. Electron microprobe data of melt in BAH13

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | K ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|------|------|------|------|-------------------|------------------|-------|-------|-------|
| 63.07 | 0.35 | 16.59 | 0.00 | 2.70 | 0.13 | 1.02 | 4.57 | 2.18 | 1.17 | 91.83 | 40.24 | -142 |
| 63.05 | 0.16 | 16.97 | 0.00 | 2.72 | 0.13 | 1.10 | 4.60 | 2.88 | 1.24 | 92.90 | 41.89 | -82 |
| 62.15 | 0.40 | 16.88 | 0.00 | 3.17 | 0.10 | 1.06 | 4.81 | 2.53 | 1.18 | 92.28 | 37.35 | -639 |
| 62.12 | 0.42 | 16.78 | 0.03 | 3.26 | 0.12 | 1.01 | 4.76 | 2.37 | 1.17 | 92.06 | 35.58 | -805 |
| 61.24 | 0.46 | 17.06 | 0.00 | 3.43 | 0.13 | 1.04 | 4.95 | 2.55 | 1.21 | 92.07 | 35.09 | -1118 |
| 61.67 | 0.44 | 17.34 | 0.00 | 3.35 | 0.12 | 1.04 | 5.01 | 2.75 | 1.21 | 92.94 | 35.62 | -938 |
| 61.81 | 0.52 | 16.95 | 0.00 | 3.51 | 0.11 | 1.04 | 4.91 | 2.82 | 1.18 | 92.86 | 34.56 | -935 |
| 61.22 | 0.55 | 17.13 | 0.00 | 3.38 | 0.14 | 1.03 | 4.90 | 2.39 | 1.17 | 91.91 | 35.20 | -1148 |
| 61.45 | 0.46 | 17.18 | 0.23 | 3.42 | 0.12 | 1.01 | 4.96 | 2.59 | 1.19 | 92.60 | 34.49 | -1307 |
| 62.49 | 0.34 | 16.64 | 0.15 | 3.28 | 0.17 | 1.03 | 4.75 | 2.60 | 1.19 | 92.64 | 35.89 | -1593 |
| 61.91 | 0.56 | 16.98 | 0.16 | 3.31 | 0.13 | 0.99 | 4.85 | 2.53 | 1.13 | 92.59 | 34.77 | -1399 |
| 62.65 | 0.32 | 16.36 | 0.06 | 3.32 | 0.14 | 0.99 | 4.65 | 2.57 | 1.18 | 92.24 | 34.71 | -1566 |

Table S2-8. Electron microprobe data of traverse on an orthopyroxene grain in BAH13 used in Figure S3

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | K ₂ O | NiO | Total | D |
|------------------|------------------|--------------------------------|--------------------------------|------|------|-------|------|-------------------|------------------|------|-------|-----|
| 53.19 | 0.10 | 5.92 | 0.66 | 6.30 | 0.09 | 31.05 | 1.08 | 0.03 | 0.02 | 0.14 | 98.57 | 0 |
| 53.12 | 0.05 | 6.06 | 0.78 | 6.61 | 0.24 | 31.02 | 1.19 | 0.03 | 0.02 | 0.12 | 99.24 | 16 |
| 52.72 | 0.05 | 5.97 | 0.80 | 6.92 | 0.18 | 31.35 | 1.11 | 0.02 | 0.00 | 0.06 | 99.18 | 35 |
| 53.11 | 0.11 | 6.06 | 0.74 | 6.50 | 0.11 | 30.92 | 1.02 | 0.01 | 0.03 | 0.13 | 98.73 | 42 |
| 51.94 | 0.10 | 7.29 | 0.44 | 7.58 | 0.12 | 29.70 | 1.29 | 0.05 | 0.01 | 0.10 | 98.62 | 50 |
| 50.66 | 0.10 | 8.77 | 0.34 | 8.38 | 0.13 | 28.98 | 1.61 | 0.00 | 0.00 | 0.14 | 99.10 | 65 |
| 50.97 | 0.17 | 7.82 | 0.03 | 8.46 | 0.18 | 29.65 | 1.45 | 0.02 | 0.00 | 0.11 | 98.85 | 80 |
| 51.36 | 0.26 | 7.59 | 0.05 | 8.48 | 0.13 | 29.96 | 1.04 | 0.00 | 0.01 | 0.15 | 99.03 | 90 |
| 50.73 | 0.28 | 8.70 | 0.00 | 9.64 | 0.32 | 28.81 | 0.92 | 0.02 | 0.00 | 0.10 | 99.52 | 100 |

Table S2-9. Electron microprobe data of traverse on a plagioclase grain in BAH13 used in Figure S5

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | K ₂ O | Total | An | D |
|------------------|------------------|--------------------------------|--------------------------------|------|------|------|-------|-------------------|------------------|--------|-------|-----|
| 52.93 | 0.00 | 29.26 | 0.01 | 0.48 | 0.00 | 0.06 | 13.01 | 4.12 | 0.15 | 100.01 | 63.58 | 0 |
| 52.91 | 0.13 | 29.13 | 0.00 | 0.34 | 0.00 | 0.05 | 12.66 | 4.05 | 0.13 | 99.39 | 63.33 | 12 |
| 52.37 | 0.13 | 29.26 | 0.05 | 0.38 | 0.06 | 0.04 | 12.91 | 4.00 | 0.13 | 99.31 | 64.06 | 24 |
| 51.01 | 0.05 | 27.41 | 0.04 | 0.41 | 0.03 | 0.06 | 11.58 | 4.16 | 0.12 | 94.88 | 60.62 | 37 |
| 54.17 | 0.00 | 28.35 | 0.00 | 0.48 | 0.02 | 0.07 | 12.19 | 4.50 | 0.14 | 99.92 | 59.97 | 44 |
| 54.22 | 0.00 | 28.52 | 0.00 | 0.46 | 0.01 | 0.05 | 12.53 | 4.61 | 0.11 | 100.50 | 60.05 | 52 |
| 53.80 | 0.00 | 28.72 | 0.00 | 0.40 | 0.00 | 0.05 | 12.46 | 4.32 | 0.15 | 99.90 | 61.44 | 63 |
| 53.02 | 0.08 | 29.32 | 0.00 | 0.38 | 0.01 | 0.05 | 12.68 | 4.35 | 0.14 | 100.01 | 61.71 | 81 |
| 53.80 | 0.00 | 29.30 | 0.04 | 0.36 | 0.01 | 0.05 | 12.74 | 4.15 | 0.11 | 100.55 | 62.89 | 90 |
| 54.93 | 0.05 | 28.22 | 0.02 | 0.47 | 0.05 | 0.05 | 11.75 | 4.94 | 0.14 | 100.61 | 56.78 | 101 |
| 55.92 | 0.03 | 27.62 | 0.00 | 0.42 | 0.00 | 0.01 | 11.12 | 5.34 | 0.20 | 100.67 | 53.50 | 121 |

Table S3-1. Electron microprobe data of amphibole in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|-------|-------------------|-------|-------|-------|
| 41.11 | 1.82 | 17.54 | 0.14 | 10.34 | 0.18 | 13.70 | 10.76 | 2.66 | 98.24 | 70.25 | -137 |
| 40.46 | 2.57 | 17.61 | 0.15 | 10.09 | 0.15 | 14.17 | 10.40 | 2.74 | 98.33 | 71.46 | -111 |
| 41.79 | 0.78 | 18.01 | 0.09 | 9.29 | 0.18 | 14.92 | 10.37 | 2.41 | 97.85 | 74.11 | 92 |
| 40.88 | 2.98 | 17.26 | 0.04 | 7.41 | 0.11 | 16.46 | 10.01 | 2.85 | 98.00 | 79.84 | 114 |
| 41.39 | 1.81 | 16.78 | 0.13 | 10.44 | 0.18 | 13.87 | 10.76 | 2.47 | 97.83 | 70.31 | -90 |
| 40.86 | 2.05 | 17.41 | 0.06 | 10.08 | 0.15 | 14.27 | 10.58 | 2.66 | 98.11 | 71.62 | -79 |
| 41.42 | 1.61 | 17.55 | 0.01 | 9.28 | 0.17 | 14.71 | 10.49 | 2.48 | 97.71 | 73.86 | 96 |
| 42.37 | 2.15 | 16.41 | 0.02 | 7.04 | 0.12 | 17.33 | 9.55 | 2.96 | 97.95 | 81.44 | 260 |
| 41.67 | 2.53 | 16.72 | 0.03 | 6.88 | 0.14 | 17.17 | 9.89 | 2.83 | 97.84 | 81.65 | 391 |
| 42.72 | 2.55 | 15.84 | 0.03 | 6.70 | 0.15 | 17.65 | 9.74 | 2.75 | 98.12 | 82.44 | 560 |
| 43.18 | 0.86 | 16.44 | 0.40 | 6.15 | 0.10 | 18.12 | 10.21 | 2.78 | 98.25 | 84.01 | 981 |
| 39.59 | 2.75 | 18.11 | 0.04 | 10.42 | 0.18 | 13.60 | 10.55 | 2.65 | 97.88 | 69.94 | -371 |
| 41.19 | 2.24 | 17.02 | ND | 10.21 | 0.17 | 14.26 | 10.40 | 2.69 | 98.17 | 71.34 | -342 |
| 39.94 | 2.70 | 18.21 | 0.02 | 9.59 | 0.13 | 14.84 | 9.84 | 2.73 | 98.00 | 73.39 | -1067 |
| 40.77 | 2.27 | 16.94 | 0.08 | 10.12 | 0.14 | 14.17 | 10.90 | 2.52 | 97.91 | 71.40 | -1057 |
| 39.96 | 2.80 | 17.96 | 0.01 | 9.32 | 0.14 | 14.65 | 10.49 | 2.78 | 98.11 | 73.70 | -1260 |
| 40.99 | 2.03 | 17.04 | 0.02 | 10.16 | 0.17 | 14.10 | 10.66 | 2.53 | 97.71 | 71.21 | -1085 |

Table S3-2. Electron microprobe data of olivine in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | NiO | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------------------|------|--------|-------|-----|
| 40.04 | 0.02 | 0.02 | 0.02 | 12.45 | 0.16 | 46.94 | 0.09 | 0.03 | NA | 99.77 | 87.05 | 122 |
| 40.24 | 0.01 | 0.03 | 0.03 | 11.35 | 0.20 | 47.67 | 0.15 | ND | NA | 99.68 | 88.22 | 95 |
| 40.34 | 0.01 | 0.03 | 0.08 | 11.61 | 0.19 | 47.71 | 0.15 | ND | NA | 100.13 | 87.99 | 259 |
| 40.42 | ND | 0.04 | 0.06 | 11.11 | 0.17 | 48.00 | 0.19 | 0.05 | NA | 100.04 | 88.51 | 374 |
| 40.46 | 0.01 | 0.02 | 0.07 | 10.62 | 0.15 | 48.50 | 0.16 | 0.01 | NA | 99.99 | 89.06 | 523 |
| 40.77 | ND | 0.02 | 0.06 | 9.76 | 0.17 | 49.31 | 0.15 | 0.01 | NA | 100.26 | 90.01 | 719 |
| 40.52 | ND | 0.04 | 0.06 | 10.87 | 0.17 | 48.40 | 0.16 | ND | NA | 100.22 | 88.81 | 677 |
| 40.65 | 0.01 | 0.01 | 0.06 | 9.85 | 0.18 | 49.21 | 0.14 | 0.03 | NA | 100.14 | 89.90 | 856 |
| 40.21 | ND | 0.01 | 0.04 | 11.82 | 0.14 | 47.50 | 0.15 | 0.02 | 0.32 | 100.22 | 87.75 | 116 |
| 40.35 | 0.02 | ND | 0.04 | 11.54 | 0.21 | 47.14 | 0.22 | 0.03 | 0.35 | 100.08 | 87.92 | 133 |
| 40.48 | 0.01 | 0.02 | 0.05 | 11.38 | 0.18 | 47.88 | 0.17 | 0.01 | 0.34 | 100.52 | 88.24 | 276 |
| 40.62 | 0.01 | 0.03 | 0.05 | 10.90 | 0.20 | 48.25 | 0.17 | ND | 0.33 | 100.55 | 88.75 | 370 |
| 40.67 | ND | 0.04 | 0.05 | 11.21 | 0.16 | 48.13 | 0.19 | 0.02 | 0.32 | 100.80 | 88.44 | 528 |
| 40.55 | 0.01 | 0.03 | 0.04 | 10.57 | 0.16 | 48.19 | 0.15 | ND | 0.35 | 100.06 | 89.04 | 709 |
| 40.96 | 0.01 | 0.03 | 0.07 | 9.73 | 0.19 | 49.41 | 0.15 | 0.01 | 0.33 | 100.89 | 90.05 | 715 |
| 40.93 | 0.01 | 0.02 | 0.05 | 9.40 | 0.16 | 49.68 | 0.11 | ND | 0.36 | 100.72 | 90.40 | 876 |

Table S3-3. Electron microprobe data of orthopyroxene in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X | Comment |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------------------|--------|-------|-------|------------------------|
| 52.47 | 0.22 | 7.04 | 0.55 | 7.85 | 0.17 | 30.21 | 1.89 | 0.04 | 100.43 | 87.28 | 34 | |
| 54.48 | 0.12 | 4.96 | 0.40 | 6.39 | 0.15 | 32.62 | 0.96 | 0.10 | 100.18 | 90.10 | 2 | |
| 50.91 | 0.34 | 8.89 | 0.02 | 9.16 | 0.19 | 29.07 | 1.69 | 0.06 | 100.35 | 84.98 | 37 | |
| 52.53 | 0.20 | 6.61 | 0.49 | 7.93 | 0.14 | 30.49 | 1.69 | 0.04 | 100.12 | 87.27 | 28 | |
| 51.74 | 0.32 | 8.21 | 0.06 | 7.88 | 0.19 | 29.89 | 1.65 | 0.03 | 99.97 | 87.12 | 695 | |
| 51.83 | 0.29 | 8.29 | 0.12 | 7.98 | 0.16 | 30.23 | 1.30 | 0.06 | 100.27 | 87.10 | 665 | |
| 51.21 | 0.26 | 9.70 | 0.10 | 7.67 | 0.17 | 29.81 | 1.54 | 0.05 | 100.50 | 87.39 | 856 | |
| 52.17 | 0.22 | 7.41 | 0.15 | 8.55 | 0.23 | 30.10 | 1.49 | 0.03 | 100.34 | 86.26 | 856 | |
| 49.44 | 0.46 | 10.07 | 0.02 | 11.57 | 0.23 | 26.85 | 1.81 | 0.06 | 100.52 | 80.53 | -1067 | In center part of amph |
| 49.79 | 0.33 | 9.83 | 0.04 | 10.94 | 0.21 | 27.48 | 1.22 | 0.04 | 99.89 | 81.74 | -1305 | In center part of amph |

Table S3-4. Electron microprobe data of clinopyroxene in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|------|------|-------|-------|-------------------|--------|-------|-------|
| 51.09 | 0.29 | 5.23 | 1.03 | 4.37 | 0.12 | 17.93 | 18.98 | 0.50 | 99.53 | 87.97 | -44 |
| 50.56 | 0.36 | 6.39 | 0.61 | 4.94 | 0.14 | 17.89 | 18.36 | 0.42 | 99.66 | 86.59 | -7 |
| 50.86 | 0.39 | 6.30 | 0.39 | 4.89 | 0.14 | 17.69 | 18.56 | 0.43 | 99.64 | 86.57 | -66 |
| 51.05 | 0.27 | 5.23 | 1.19 | 4.40 | 0.14 | 18.27 | 18.34 | 0.48 | 99.37 | 88.10 | -5 |
| 50.81 | 0.20 | 4.51 | 1.00 | 4.78 | 0.16 | 17.21 | 20.43 | 0.24 | 99.34 | 86.52 | 266 |
| 53.36 | 0.12 | 3.25 | 0.84 | 5.07 | 0.18 | 22.69 | 13.92 | 0.31 | 99.74 | 88.86 | 408 |
| 53.92 | 0.10 | 3.11 | 0.72 | 5.02 | 0.18 | 22.85 | 14.01 | 0.27 | 100.18 | 89.03 | 560 |
| 49.93 | 0.28 | 7.63 | 1.25 | 4.66 | 0.14 | 17.35 | 18.36 | 0.49 | 100.08 | 86.91 | 697 |
| 49.91 | 0.23 | 7.83 | 1.04 | 4.48 | 0.12 | 17.24 | 18.66 | 0.47 | 99.98 | 87.28 | 891 |
| 50.53 | 0.46 | 6.55 | 0.20 | 5.41 | 0.16 | 17.56 | 18.31 | 0.38 | 99.56 | 85.26 | -421 |
| 50.47 | 0.50 | 6.87 | 0.21 | 5.70 | 0.18 | 17.82 | 17.80 | 0.48 | 100.03 | 84.79 | -1041 |
| 50.29 | 0.53 | 6.85 | 0.32 | 5.43 | 0.18 | 17.60 | 17.98 | 0.42 | 99.57 | 85.25 | -1124 |

Table S3-5. Electron microprobe data of spinel in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Total | Mg# | Cr# | X |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|------|-------|-------|-------|------|
| 0.13 | 0.39 | 34.09 | 29.26 | 20.32 | 0.12 | 14.59 | 0.06 | 98.07 | 56.14 | 36.54 | 89 |
| 0.13 | 0.33 | 26.34 | 36.90 | 20.93 | 0.15 | 13.80 | 0.18 | 97.98 | 54.02 | 48.45 | 300 |
| 0.14 | 0.32 | 28.45 | 34.45 | 20.74 | 0.15 | 13.67 | 0.20 | 97.34 | 54.02 | 44.82 | 222 |
| 0.14 | 0.24 | 26.99 | 36.11 | 20.55 | 0.13 | 13.40 | 0.13 | 96.92 | 53.76 | 47.30 | 392 |
| 0.14 | 0.20 | 24.38 | 39.53 | 20.47 | 0.13 | 13.23 | 0.02 | 97.35 | 53.53 | 52.09 | 669 |
| 0.13 | 0.20 | 23.17 | 41.91 | 19.61 | 0.16 | 13.05 | 0.14 | 97.65 | 54.26 | 54.82 | 835 |
| 0.18 | 0.26 | 26.50 | 38.60 | 20.29 | 0.12 | 14.18 | 0.11 | 99.40 | 55.47 | 49.42 | 938 |
| 0.18 | 0.19 | 31.63 | 33.06 | 18.32 | 0.10 | 14.99 | 0.04 | 97.59 | 59.33 | 41.21 | 1017 |

Table S3-6. Electron microprobe data of plagioclase in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | FeO | MgO | CaO | Na ₂ O | K ₂ O | Total | An | X |
|------------------|------------------|--------------------------------|------|------|-------|-------------------|------------------|--------|-------|-------|
| 54.77 | 0.02 | 29.35 | 0.41 | 0.06 | 11.43 | 4.73 | 0.01 | 100.76 | 57.18 | -206 |
| 53.53 | 0.01 | 30.46 | 0.37 | 0.03 | 12.38 | 4.39 | 0.01 | 101.19 | 60.91 | -226 |
| 55.08 | 0.01 | 29.08 | 0.40 | 0.03 | 11.12 | 4.97 | 0.01 | 100.71 | 55.29 | -283 |
| 54.85 | 0.01 | 29.34 | 0.40 | 0.06 | 11.46 | 4.91 | 0.01 | 101.04 | 56.33 | -559 |
| 55.46 | 0.01 | 28.97 | 0.45 | 0.04 | 10.91 | 4.85 | 0.02 | 100.71 | 55.42 | -730 |
| 54.74 | 0.02 | 29.24 | 0.36 | 0.02 | 11.24 | 4.86 | 0.01 | 100.49 | 56.10 | -925 |
| 53.73 | 0.02 | 30.11 | 0.44 | 0.05 | 12.10 | 4.46 | ND | 100.91 | 59.99 | -1011 |
| 52.51 | 0.02 | 30.62 | 0.41 | 0.07 | 12.87 | 3.83 | 0.01 | 100.34 | 65.00 | -1211 |
| 53.13 | 0.04 | 30.22 | 0.41 | 0.07 | 12.36 | 4.35 | 0.02 | 100.60 | 61.09 | -1250 |
| 52.18 | 0.01 | 30.82 | 0.40 | 0.04 | 13.03 | 3.94 | 0.01 | 100.43 | 64.63 | -1258 |
| 52.88 | 0.04 | 30.66 | 0.36 | 0.09 | 12.63 | 3.88 | 0.01 | 100.55 | 64.27 | -1485 |
| 52.30 | 0.03 | 30.93 | 0.31 | 0.09 | 13.06 | 3.81 | 0.01 | 100.55 | 65.45 | -1485 |
| 53.52 | 0.03 | 30.30 | 0.40 | 0.04 | 12.44 | 4.24 | ND | 100.97 | 61.85 | -1485 |
| 52.95 | 0.01 | 30.62 | 0.42 | 0.04 | 12.73 | 3.92 | 0.02 | 100.73 | 64.22 | -276 |
| 54.63 | 0.02 | 29.26 | 0.47 | 0.05 | 11.45 | 4.84 | 0.01 | 100.71 | 56.66 | -431 |

Table S3-7. Electron microprobe data of melt in MBH12

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | K ₂ O | Total | Mg# | X |
|------------------|------------------|--------------------------------|--------------------------------|------|------|------|------|-------------------|------------------|-------|-------|-------|
| 60.32 | 0.06 | 18.37 | ND | 2.21 | 0.05 | 1.76 | 5.60 | 0.58 | 0.05 | 89.00 | 58.67 | 41 |
| 58.94 | 0.08 | 18.10 | 0.25 | 2.39 | 0.09 | 1.73 | 5.72 | 2.32 | 0.05 | 89.67 | 56.34 | 136 |
| 61.99 | 0.21 | 16.52 | 0.03 | 2.07 | 0.06 | 1.32 | 5.31 | 2.29 | 0.05 | 89.84 | 53.20 | -27 |
| 62.27 | 0.28 | 17.09 | ND | 2.12 | 0.06 | 1.32 | 5.57 | 2.52 | 0.06 | 91.34 | 52.60 | -80 |
| 62.08 | 0.26 | 16.73 | ND | 2.37 | 0.10 | 1.28 | 5.70 | 2.33 | 0.06 | 90.91 | 49.05 | -285 |
| 62.18 | 0.27 | 16.82 | ND | 2.35 | 0.07 | 1.31 | 5.72 | 2.67 | 0.06 | 91.45 | 49.84 | -378 |
| 62.01 | 0.30 | 16.92 | ND | 2.45 | 0.11 | 1.30 | 5.70 | 2.48 | 0.05 | 91.32 | 48.61 | -593 |
| 62.10 | 0.29 | 16.92 | ND | 2.51 | 0.10 | 1.27 | 5.71 | 2.79 | 0.05 | 91.77 | 47.42 | -716 |
| 61.97 | 0.24 | 17.08 | ND | 2.48 | 0.10 | 1.31 | 5.76 | 2.45 | 0.06 | 91.46 | 48.50 | -810 |
| 61.91 | 0.26 | 17.12 | 0.14 | 2.34 | 0.10 | 1.30 | 5.69 | 2.40 | 0.06 | 91.33 | 49.76 | -1005 |
| 61.47 | 0.34 | 16.77 | 0.02 | 2.78 | 0.08 | 1.25 | 5.81 | 2.43 | 0.06 | 91.05 | 44.49 | -1105 |
| 61.97 | 0.30 | 16.56 | 0.07 | 2.44 | 0.02 | 1.26 | 5.74 | 2.25 | 0.06 | 90.74 | 47.93 | -1329 |
| 61.37 | 0.33 | 16.67 | ND | 2.62 | 0.09 | 1.22 | 5.81 | 2.42 | 0.04 | 90.57 | 45.36 | -1358 |
| 60.98 | 0.35 | 17.27 | ND | 2.82 | 0.08 | 1.26 | 5.96 | 2.33 | 0.05 | 91.11 | 44.33 | -1510 |

Table S3-8. Electron microprobe data of traverse on an amphibole grain with orthopyroxene in the center part in MBH12 used in Figure S4

| SiO ₂ | TiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | FeO | MnO | MgO | CaO | Na ₂ O | K ₂ O | NiO | Total | Mg# | D | Mineral |
|------------------|------------------|--------------------------------|--------------------------------|-------|------|-------|-------|-------------------|------------------|------|-------|-------|--------|---------|
| 50.54 | 0.31 | 9.72 | 0.06 | 10.95 | 0.14 | 26.78 | 1.27 | 0.06 | 0.03 | 0.04 | 99.90 | 81.34 | 0.00 | Opx |
| 40.05 | 2.57 | 16.70 | 0.07 | 9.13 | 0.11 | 14.26 | 10.37 | 1.37 | 0.02 | 0.05 | 94.70 | 73.57 | 38.83 | Amph |
| 40.25 | 2.54 | 16.72 | 0.00 | 8.59 | 0.12 | 14.44 | 10.60 | 1.43 | 0.04 | 0.00 | 94.72 | 74.97 | 50.70 | Amph |
| 40.01 | 2.59 | 17.05 | 0.00 | 8.69 | 0.13 | 14.44 | 10.16 | 1.39 | 0.02 | 0.00 | 94.24 | 74.43 | 62.10 | Amph |
| 40.41 | 2.49 | 16.72 | 0.04 | 8.38 | 0.13 | 14.29 | 10.59 | 1.37 | 0.01 | 0.00 | 94.44 | 75.25 | 71.84 | Amph |
| 40.03 | 2.32 | 16.50 | 0.03 | 8.50 | 0.15 | 14.15 | 10.35 | 1.41 | 0.01 | 0.03 | 93.48 | 74.80 | 81.61 | Amph |
| 40.95 | 1.95 | 16.22 | 0.02 | 9.54 | 0.00 | 14.13 | 10.02 | 1.26 | 0.01 | 0.04 | 94.14 | 72.54 | 97.42 | Amph |
| 41.64 | 1.34 | 16.08 | 0.03 | 10.60 | 0.13 | 13.68 | 10.62 | 1.13 | 0.00 | 0.00 | 95.25 | 69.71 | 114.79 | Amph |