

Table 1. Compositions of the run products in the system Na₂CO₃-(Fe_{0.87}Mn_{0.06}Mg_{0.07})CO₃ at 6 GPa

| #, T, τ | X_{Na} | Phase | Compositions in wt% | | | | | Compositions in mol% | | | |
|---------------------------------|-----------------|-----------------|---------------------|-----------|--------|--------|-----------|----------------------|----------|--------|---------|
| | | | Na ₂ O | FeO | MnO | MgO | Total | Na ₂ # | Fe# | Mn# | Mg# |
| T2078, 1400 °C, 15 min | 90 | L | 46.3(2) | 7.3(3) | 0.5(0) | 0.3(0) | 54.4(5) | 86.7(4) | 88.0(2) | 5.5(2) | 6.5(0) |
| | 80 | L | 47.1(2) | 10.0(0) | 0.5(0) | 0.4(0) | 57.9(2) | 83.0(0) | 89.4(1) | 4.7(3) | 5.9(2) |
| | 70 | L | 40.6(3) | 17.2(6) | 1.1(0) | 0.8(1) | 59.7(1.0) | 70.6(6) | 87.7(2) | 5.6(0) | 6.7(2) |
| | 60 | FeO | n.d. | 93.9(5) | 0.7(1) | n.d. | 94.8(5) | n.d. | 99.3(1) | 0.7(1) | n.d. |
| | | L | 35.0(2) | 22.1(2) | 1.3(1) | 1.0(1) | 59.5(1) | 61.6(4) | 87.6(1) | 5.3(2) | 7.0(4) |
| | 40 | L | 25.1(1) | 37.9(1) | 2.4(1) | 1.8(0) | 67.2(1) | 40.0(1) | 87.0(2) | 5.6(1) | 7.4(1) |
| | 30 | Sd | n.d. | 52.9(4) | 3.1(1) | 4.4(1) | 60.3(5) | n.d. | 82.9(2) | 4.8(1) | 12.3(3) |
| | | L | 21.8(1.0) | 41.5(1) | 2.6(1) | 1.6(2) | 67.5(1.4) | 34.9(8) | 88.4(9) | 5.5(2) | 6.1(7) |
| | 10 | Sd | n.d. | 52.6(4) | 3.3(1) | 3.4(1) | 59.3(4) | n.d. | 84.8(3) | 5.5(2) | 9.7(1) |
| | | L | 22.5 | 41.6 | 2.7 | 1.7 | 68.5 | 35.5 | 87.8 | 5.7 | 6.6 |
| ES357, 1300 °C, 1 h | 90 | Na ₂ | 51.7(7) | 1.5(2) | n.d. | n.d. | 53.2(5) | 97.7(3) | 100.0(0) | n.d. | n.d. |
| | | L | 46.4(3) | 7.7(4) | 0.5(0) | n.d. | 54.6(1) | 86.8(7) | 94.0(2) | 6.0(2) | n.d. |
| | 80 | L | 45.7 | 10.8 | 0.5 | 0.4 | 57.4 | 81.5 | 89.5 | 4.3 | 6.2 |
| | 70 | L | 41.7(2) | 16.3(1) | 1.0(0) | 0.8(1) | 59.8(2) | 72.1(1) | 87.2(8) | 5.2(2) | 7.6(6) |
| | 60 | FeO | n.d. | 95.8(4) | 0.7(1) | n.d. | 96.5(5) | n.d. | 99.3(1) | 0.7(1) | n.d. |
| | | L | 36.3 | 21.7 | 1.4 | 1.1 | 60.5 | 62.7 | 86.8 | 5.6 | 7.6 |
| | 50 | FeO | n.d. | 96.2(5) | 0.6(0) | n.d. | 96.8(5) | n.d. | 99.4(0) | 0.6(0) | n.d. |
| | | L | 29.1 | 32.1 | 2.1 | 1.4 | 64.5 | 47.9 | 87.6 | 5.7 | 6.7 |
| | 30 | Sd | n.d. | 52.6(3) | 3.0(1) | 4.0(2) | 59.3(3) | n.d. | 83.8(5) | 4.8(1) | 11.4(4) |
| | | L | 29.4(5) | 33.6(3) | 2.1(1) | 1.3(1) | 66.3(7) | 47.4(3) | 88.6(1) | 5.5(3) | 5.9(3) |
| ES356, 1200 °C, 5 h | 20 | Sd | n.d. | 53.9(2) | 3.1(2) | 3.3(1) | 60.2(2) | n.d. | 85.7(2) | 5.2(3) | 9.1(1) |
| | | L | 30.8(3) | 33.1(3) | 2.3(0) | 0.9(1) | 67.1(5) | 49.1(1) | 89.3(4) | 6.3(0) | 4.3(4) |
| | 10 | Sd | n.d. | 53.5(3) | 3.4(1) | 2.8(2) | 59.6(2) | n.d. | 86.5(4) | 5.5(1) | 8.0(4) |
| | | L | 28.7(4) | 33.1(1) | 2.4(2) | 0.8(1) | 64.9(0) | 47.4(6) | 89.6(6) | 6.4(4) | 3.9(2) |
| | 80 | Na ₂ | 51.5(3) | 1.9(0) | n.d. | n.d. | 53.4(3) | 96.9(0) | 100.0(0) | n.d. | n.d. |
| | | L | 42.6 | 14.9 | 0.9 | 0.6 | 59.1 | 74.4 | 87.9 | 5.6 | 6.5 |
| | 70 | L | 41.1 | 17.0 | 1.0 | 0.7 | 59.9 | 71.1 | 87.9 | 5.4 | 6.8 |
| | 60 | FeO | n.d. | 96.9 | 0.6 | n.d. | 97.5 | n.d. | 99.4 | 0.6 | n.d. |
| | | L | 34.4(1.4) | 22.5(1.1) | 1.5(2) | 1.3(1) | 59.6(0) | 60.3(2.2) | 85.8(5) | 5.7(5) | 8.5(0) |
| | 40 | Sd | n.d. | 53.2(1) | 2.9(0) | 4.2(2) | 60.3(2) | n.d. | 83.7(5) | 4.6(1) | 11.6(4) |
| | | FeO | n.d. | 96.4 | 0.6 | n.d. | 97.0 | n.d. | 99.4 | 0.6 | n.d. |
| | | L | 30.7(3) | 28.6(0) | 1.9(0) | 1.2(1) | 62.4(2) | 52.1(3) | 87.5(2) | 6.0(0) | 6.5(2) |
| | 30 | Sd | n.d. | 53.7(5) | 3.2(1) | 3.2(1) | 60.1(3) | n.d. | 85.7(6) | 5.1(3) | 9.2(4) |
| | | FeO | n.d. | 95.0 | 0.6 | n.d. | 95.6 | n.d. | 99.4 | 0.6 | n.d. |

| | | | | | | | | | | | |
|-------------------------------|----|--------------------------------|---------|---------|--------|--------|-----------|-----------|-----------|---------|----------|
| T2077, 1100 °C, 9 h | | L | 29.1(2) | 27.3(0) | 2.2(0) | 1.0(1) | 59.6(1) | 51.8(3) | 87.1(5) | 7.2(1) | 5.8(6) |
| | 20 | Sd | n.d. | 54.0(2) | 3.2(1) | 3.1(1) | 60.3(2) | n.d. | 86.0(3) | 5.2(1) | 8.7(3) |
| | | L | 31.7(9) | 28.7(2) | 2.0(1) | 0.8(1) | 63.1(8) | 53.4(9) | 89.3(5) | 6.3(2) | 4.4(3) |
| | 10 | Sd | n.d. | 53.8(5) | 3.3(1) | 2.8(2) | 59.8(4) | n.d. | 86.7(5) | 5.3(1) | 8.0(5) |
| | | L | 31.8(4) | 26.0(4) | 1.9(0) | 0.6(0) | 60.3(0) | 56.0(5) | 89.7(5) | 6.7(2) | 3.5(2) |
| | 80 | Na ₂ | 51.5(4) | 2.5(1) | n.d. | n.d. | 54.1(4) | 95.8(2) | 100.0(0) | n.d. | n.d. |
| | | L | 40.8(1) | 16.4(3) | 1.0(0) | 1.0(1) | 58.9(3) | 71.5(5) | 87.1(4) | 5.2(1) | 7.7(3) |
| | 70 | Na ₂ | 51.5(7) | 2.6(3) | n.d. | n.d. | 54.3(6) | 95.6(3) | 100.0(0) | n.d. | n.d. |
| | | L | 40.8 | 18.2 | 1.1 | n.d. | 54.3(6) | 69.6 | 87.9 | 5.4 | 6.7 |
| | 60 | FeO | n.d. | 96.6 | 0.6 | n.d. | 97.2 | n.d. | 99.4 | 0.6 | n.d. |
| | | L | 35.0 | 22.0 | 1.4 | 1.1 | 59.5 | 61.5 | 86.9 | 5.5 | 7.6 |
| | 50 | Sd | n.d. | 52.7(3) | 2.8(1) | 5.0(1) | 60.5(1) | n.d. | 81.7(4) | 4.3(2) | 13.9(2) |
| | | Fe ₃ O ₄ | n.d. | 91.5 | n.d. | n.d. | 91.5 | n.d. | 100.0(0) | n.d. | n.d. |
| | | L | 30.4(2) | 25.8(3) | 1.7(0) | 1.3(2) | 59.1(3) | 54.2(1) | 86.8(8) | 5.8(1) | 7.5(1.0) |
| | 40 | Sd | n.d. | 53.9(6) | 3.1(1) | 3.7(3) | 60.7(5) | n.d. | 84.7(7) | 4.9(2) | 10.4(7) |
| | | Fe ₃ O ₄ | n.d. | 91.6 | n.d. | n.d. | 91.6 | n.d. | 100.0(0) | n.d. | n.d. |
| | | L | 28.9(7) | 27.1(4) | 1.9(0) | 1.0(0) | 58.8(1.2) | 52.1(3) | 88.1(1) | 6.2(0) | 5.7(2) |
| | 30 | Sd | n.d. | 54.3(8) | 3.1(1) | 3.2(1) | 60.6(8) | n.d. | 86.0(3) | 5.0(1) | 8.9(2) |
| | | Fe ₃ O ₄ | n.d. | 92.7 | n.d. | n.d. | 92.7 | n.d. | 100.0(0) | n.d. | n.d. |
| | | L | 29.1(2) | 26.8(2) | 1.8(0) | 0.7(1) | 58.3(1) | 53.1(5) | 90.0(4) | 6.0(0) | 4.0(5) |
| ES354, 1000 °C, 20 h | 20 | Sd | n.d. | 54.1(3) | 3.3(1) | 2.9(1) | 60.3(1) | n.d. | 87.3(4) | 5.5(1) | 7.2(4) |
| | | L | 29.1 | 27.3 | 1.9 | 0.7 | 59.1 | 52.5(1) | 89.4 | 6.3 | 4.3 |
| | 10 | Sd | n.d. | 54.3(9) | 3.4(1) | 2.5(1) | 60.2(9) | n.d. | 87.3(4) | 5.5(1) | 7.2(4) |
| | | L | 27.8(1) | 26.1(1) | 1.9(2) | 0.7(1) | 56.4(1) | 52.5(1) | 89.6(1) | 6.4(5) | 4.0(4) |
| | 80 | Na ₂ | 51.4(6) | 1.6(1) | n.d. | n.d. | 52.9(7) | 97.4(2) | 100.0(0) | n.d. | n.d. |
| | | Na ₄ Fe | 36.3 | 18.2 | 1.7 | 0.4 | 56.6 | 67.1 | 88.2 | 8.5 | 3.3 |
| | | Na ₂ Fe | 29.0(2) | 27.9(2) | 1.4(1) | 1.6(1) | 59.8(4) | 51.1(2) | 86.9(6) | 4.3(2) | 8.8(6) |
| | | L | 34.2(5) | 20.3(3) | 1.4(1) | n.d. | 55.9(7) | 64.7(1) | 93.5(5) | 6.5(5) | n.d. |
| | 70 | Na ₂ | 51.9(6) | 1.6(1) | n.d. | n.d. | 53.5(5) | 97.5(1) | 100.0(0) | n.d. | n.d. |
| | | Na ₄ Fe | 36.4(8) | 17.6(8) | 1.7(1) | 0.1(3) | 55.8(5) | 68.3(1.8) | 90.0(2.3) | 8.7(3) | 1.2(2.1) |
| | | Na ₂ Fe | 28.4(2) | 27.8(4) | 1.4(1) | 1.5(1) | 59.0(5) | 50.9(1) | 87.2(6) | 4.5(3) | 8.3(5) |
| | | Sd | n.d. | 52.9(7) | 3.4(3) | 2.6(9) | 59.0(6) | n.d. | 86.8(2.7) | 5.6(3) | 7.6(2.4) |
| | 60 | Na ₂ | 51.4(6) | 1.6(1) | n.d. | n.d. | 52.9(7) | 96.8(3) | 100.0(0) | n.d. | n.d. |
| | | Na ₄ Fe | 37.7(4) | 18.2(2) | 1.8(1) | n.d. | 57.7(4) | 68.6(3) | 90.9(5) | 9.1(5) | n.d. |
| | | Na ₂ Fe | 28.7(2) | 27.4(2) | 1.5(1) | 1.9(1) | 59.4(4) | 50.8(2) | 85.2(4) | 4.6(3) | 10.3(6) |
| | | L | 36.0(1) | 19.8(1) | 1.2(0) | n.d. | 57.0(2) | 66.5(1) | 94.2(0) | 5.8(0) | n.d. |
| 50 | | Na ₄ Fe | 36.8(6) | 17.1(1) | 1.9(1) | n.d. | 55.8(7) | 69.1(2) | 89.9(4) | 10.1(4) | n.d. |
| | | Na ₂ Fe | 27.9(2) | 27.6(5) | 1.6(1) | 1.4(1) | 58.5(7) | 50.5(4) | 87.1(6) | 5.1(3) | 7.8(7) |

| | | | | | | | | | | |
|------------------------------|--------------------------------|-----------|-----------|--------|-----------------------|-----------|---------|-----------|--------|----------|
| | Sd | n.d. | 53.6(8) | 3.3(2) | 1.9(4) | 58.7(2) | n.d. | 89.0(1.6) | 5.5(3) | 5.5(1.3) |
| 40 | Na ₂ Fe | 28.4(3) | 27.4(3) | 1.7(1) | 1.5(1) | 59.0(6) | 50.9(1) | 86.1(2) | 5.3(2) | 8.6(4) |
| | Sd | n.d. | 53.0(5) | 3.5(3) | 2.3(5) | 58.7(4) | n.d. | 87.4(1.7) | 5.8(4) | 6.8(1.3) |
| 30 | Na ₂ Fe | 28.8(4) | 27.1(6) | 1.8(1) | 1.8(2) | 59.5(9) | 51.0(6) | 84.2(7) | 5.6(3) | 10.2(9) |
| | Sd | n.d. | 54.5(2) | 3.3(1) | 2.0(2) | 59.9(5) | n.d. | 88.9(7) | 5.4(3) | 5.7(6) |
| | Fe ₃ O ₄ | n.d. | 92.0 | n.d. | n.d. | 92.0 | n.d. | 100.0(0) | n.d. | n.d. |
| 20 | Na ₂ Fe | 29.0(2) | 26.7(2) | 1.7(1) | 2.2(1) | 59.6(2) | 51.0(3) | 82.6(4) | 5.3(2) | 12.1(5) |
| | Sd | n.d. | 53.5(3) | 3.4(1) | 2.4(3) | 59.3(1) | n.d. | 87.4(8) | 5.6(2) | 7.0(8) |
| 10 | Na ₄ Fe | 36.9(6) | 15.6(2) | 1.7(1) | 0.5(0) | 54.6(7) | 70.2(3) | 85.6(2) | 9.4(5) | 5.0(3) |
| | Na ₂ Fe | 28.8 | 28.3 | 1.9 | 1.3 | 60.3 | 50.6 | 87.1 | 5.8 | 7.0 |
| | Sd | n.d. | 53.7(7) | 3.3(1) | 2.5(1) | 59.5(9) | n.d. | 87.4(1) | 5.4(1) | 7.2(1) |
| 80 | Na ₂ | 51.3(6) | 1.3(1) | n.d. | n.d. | 52.6(7) | 97.8(2) | 100.0(0) | n.d. | n.d. |
| | Na ₂ Fe | 29.2(3) | 28.3(3) | 1.7(1) | 1.4(2) | 60.6(6) | 51.0(1) | 87.0(8) | 5.3(1) | 7.7(9) |
| | Sd | n.d. | 54.2(3) | 3.5(1) | 2.3(2) | 60.0(4) | n.d. | 87.6(7) | 5.7(2) | 6.6(6) |
| 70 | Na ₂ | 52.0(1.5) | 1.3(1) | n.d. | n.d. | 53.3(1.5) | 97.8(2) | 100.0(0) | n.d. | n.d. |
| | Na ₂ Fe | 28.4(5) | 28.0(2) | 1.7(1) | 1.3(1) | 59.4(7) | 50.7(4) | 87.2(4) | 5.4(2) | 7.4(5) |
| | Sd | n.d. | 54.4(5) | 3.4(2) | 1.7(4) | 59.5(1) | n.d. | 89.3(1.4) | 5.7(2) | 4.9(1.2) |
| 60 | Na ₂ | 52.3(2) | 2.0(1) | n.d. | n.d. | 54.2(2) | 96.8(2) | 100.0(0) | n.d. | n.d. |
| | Na ₂ Fe | 28.8(1) | 28.5(0) | 1.7(1) | 1.3(0) | 60.2(1) | 50.7(1) | 87.7(1) | 5.4(2) | 6.9(3) |
| | Sd | n.d. | 55.1(3) | 3.5(2) | 1.9(1) | 60.6(2) | n.d. | 88.8(1) | 5.8(3) | 5.5(1) |
| T2076, 900 °C, 32 h | 50 Na ₂ | 51.4(1) | 1.5(1) | n.d. | n.d. | 52.9(1) | 97.5(2) | 100.0(0) | n.d. | n.d. |
| | Na ₂ Fe | 28.4(5) | 28.1(2) | 1.8(1) | 1.4(1) | 59.7(6) | 50.4(4) | 86.8(5) | 5.6(2) | 7.6(6) |
| | Sd | n.d. | 52.2(2.0) | 3.5(1) | 1.9(1) | 57.6(2.1) | n.d. | 88.3(2) | 6.1(3) | 5.6(1) |
| 40 | Na ₂ Fe | 28.5(2) | 27.8(2) | 1.8(0) | 1.4(1) | 59.5(4) | 50.8(2) | 86.7(3) | 5.6(1) | 7.7(3) |
| | Sd | n.d. | 55.0(9) | 3.2(2) | 1.8(1) | 60.0(8) | n.d. | 89.5(4) | 5.3(2) | 5.2(4) |
| 30 | Na ₂ Fe | 28.7(1) | 27.7(1) | 1.8(0) | 1.6(3) | 59.7(1) | 50.4(1) | 84.7(1) | 5.5(1) | 9.7(0) |
| | Sd | n.d. | 54.3(8) | 3.2(4) | 2.0(1) | 59.6(4) | n.d. | 88.8(9) | 5.4(8) | 5.9(2) |
| 20 | Na ₂ Fe | 29.0(5) | 26.8(7) | 1.7(1) | 2.2(1) | 59.6(1.0) | 50.9(7) | 82.5(3) | 5.2(1) | 12.3(2) |
| | Sd | n.d. | 54.6(1.0) | 3.5(2) | 2.0(3) | 60.0(9) | n.d. | 88.5(8) | 5.8(3) | 5.8(1) |
| 10 | Na ₂ Fe | 29.0(5) | 26.9(5) | 1.8(0) | ^{2.6} (1) | 60.3(1.0) | 50.2(3) | 80.6(0) | 5.4(1) | 14.0(0) |
| | Sd | n.d. | 53.5(5) | 3.4(2) | 2.5(1) | 59.3(5) | n.d. | 87.3(5) | 5.5(3) | 7.2(3) |

Notes: # = run number; τ = run duration; X_{Na} = Na₂CO₃ content in the system; Na₂# = Na₂CO₃ content in the run products; Fe# = Fe/(Fe+Mn+Mg); Mn# = Mn/(Fe+Mn+Mg); Mg# = Mg/(Fe+Mn+Mg); Na₂ = Na₂CO₃; L = liquid; Sd = siderite; Na₂Fe = Na₂Fe(CO₃)₂; Na₄Fe = Na₄Fe(CO₃)₃. Standard deviations are given in parentheses, where the number of measurement is more than one.