## Appendix A: Supplmentary Data

**Table A1.** Bulk chemical compositions used for starting materials and bulk silicate Earth.

| Wt % | CI[1] | CI Fe free | EL Avg[2] | EL Fe free | Bulk Earth[3] | Bulk Earth Fe free |
|---|---|---|---|---|---|---|
| **$SiO_2$** | 34.00 | 52.99 | 41.51 | 60.55 | 34.44 | 51.230 |
| **$TiO_2$** | 0.11 | 0.17 | 0.1 | 0.15 | 0.00 | 0.002 |
| **$Al_2O_3$** | 2.50 | 3.90 | 2.14 | 3.12 | 3.00 | 4.469 |
| **$Cr_2O_3$** | 0.00 | 0.00 | 0.27 | 0.39 | 0.00 | 0.010 |
| **$Fe_2O_3$** | 0.00 | 0.00 | 0 | 0.00 | 0.000 | 0.000 |
| **FeO** | 36.16 | 0.00 | 0 | 0.00 | 0.000 | 0.000 |
| **MnO** | 0.39 | 0.61 | 0.15 | 0.21 | 0.00 | 0.002 |
| **MgO** | 24.58 | 38.31 | 22.43 | 32.72 | 25.54 | 37.986 |
| **CaO** | 2.03 | 3.16 | 0.69 | 1.00 | 2.39 | 3.559 |
| **$Na_2O$** | 1.04 | 1.62 | 0.82 | 1.19 | 0.24 | 0.361 |
| **$K_2O$** | 0.10 | 0.16 | 0.09 | 0.13 | 0.02 | 0.000 |
| **$P_2O_5$** | 0.00 | 0.00 | 0.23 | 0.34 | | 0.000 |
| **$H_2O+$** | 0.00 | 0.00 | 0.23 | 0.35 | | 0.000 |
| **$H_2O-$** | 0.00 | 0.00 | 0.14 | 0.20 | | 0.000 |
| **Fe(m)** | | 0.00 | 20.21 | 0.00 | 32.00 | 0.000 |
| **Ni** | | 0.00 | 1.53 | 0.00 | 0.02 | 0.027 |
| **Co** | | 0.00 | 0.08 | 0.00 | | 0.000 |
| **FeS** | 0.00 | 0.00 | 8.57 | 0.00 | | 0.000 |
| **C** | 0.00 | 0.00 | 0.25 | 0.36 | | 0.000 |
| **Other** | 0.00 | 0.00 | 0.93 | 0.00 | | 0.000 |
| **Total** | 100.91 | 100.91 | 100.34 | 100.70 | 97.66 | 97.65 |

1. Newsom (1995); 2. Jarosewich (1990); 3. McDonough and Sun (1995)

**Table A2**. Parameters for four evaporation models as evaluated at $t$ = 50 seconds into the evaporation process.

| | **Model 1: Steady-state atmosphere** | **Model 2: Larger body in protostellar gas** | **Model 3: Smaller body in protostellar gas** | **Model 4: Free evaporation** |
|---|---|---|---|---|
| Melt Radius (km) | 700 | 700 | 50 | 50 |
| $P\mathrm{H_2}$ (far field) bar | 1.000E-12 | 1.000E-04 | 1.000E-04 | 1.00E-12 |
| $P$ total (far field) bar | 1.000E-08 | 1.083E-04 | 1.040E-04 | 1.04E-11 |
| T (K) | 2000 | 2000 | 2000 | 2000 |
| d$s$/d$t$ (cm/s) | 6.801E-07 | 5.125E-07 | 5.264E-07 | 1.263E-05 |
| wt%MgO | 38.31 | 38.31 | 38.31 | 38.31 |
| wt%$SiO_2$ | 52.99 | 52.99 | 52.99 | 52.99 |
| wt%CaO | 3.16 | 3.16 | 3.16 | 3.16 |
| w%$Al_2O_3$ | 5.54 | 5.54 | 5.54 | 5.54 |
| $J_{evap}$ $^{24}$Mg (moles cm$^{-2}$ s$^{-1}$) | 1.099E-07 | 8.317E-06 | 8.208E-06 | 1.099E-07 |
| $J_{net}$ $^{24}$Mg (moles cm$^{-2}$ s$^{-1}$) | 6.091E-09 | 4.483E-09 | 4.553E-09 | 1.084E-07 |
| PMg saturation (bar) | 1.833E-05 | 1.388E-03 | 1.370E-03 | 1.833E-05 |
| PMg (bar) adjacent surface | 1.732E-05 | 1.387E-03 | 1.369E-03 | 2.502E-07 |
| Saturation | 0.94457 | 0.99946 | 0.99945 | 0.01365 |
| $J_{evap}$ $^{28}$Si (moles cm$^{-2}$ s$^{-1}$) | 5.226E-07 | 3.956E-05 | 3.956E-05 | 5.226E-07 |
| $J_{net}$ $^{28}$Si (moles cm$^{-2}$ s$^{-1}$) | 2.769E-08 | 2.070E-08 | 2.124E-08 | 5.124E-07 |
| $P$SiO saturation (bar) | 1.181E-04 | 8.940E-03 | 8.938E-03 | 1.181E-04 |
| $P$SiO (bar) adjacent surface | 1.118E-04 | 8.935E-03 | 8.933E-03 | 2.302E-06 |
| Saturation | 0.94701 | 0.99948 | 0.99946 | 0.01950 |
| $J$ Ca (moles cm$^{-2}$ s$^{-1}$) | 2.761E-12 | 2.386E-12 | 7.420E-10 | 1.781E-08 |
| $J$ Al total (moles cm$^{-2}$ s$^{-1}$) | 1.761E-20 | 1.960E-24 | 1.431E-09 | 3.435E-08 |
| Total gas flux (moles cm$^{-2}$ s$^{-1}$) | 2.909E-08 | 2.518E-08 | 2.587E-08 | 6.208E-07 |
| $J$ $^{24}$Mg/ $J$ $^{24}Mg_{congruent}$ | 0.37272 | 0.36803 | 0.36877 | 0.36083 |
| $J$ $^{28}$Si/ $J$ $^{28}Si_{congruent}$ | 1.82470 | 1.82970 | 1.82890 | 1.83750 |
| $J$ Ca/ J $Ca_{congruent}$ | 0.00330 | 0.00330 | 0.00330 | 0.00344 |
| $J$ $Al_{total}$/$J$ $Al_{total,\ congruent}$ | 1.092E-11 | 1.407E-15 | 2.050E-14 | 2.295E-07 |
| $\alpha_{eq}$ (melt/vapor) $^{25}$Mg/$^{24}$Mg | 1.000274 | 1.000274 | 1.000274 | 1.000274 |
| $\alpha_{evap}$ (vapor/melt) $^{25}$Mg/$^{24}$Mg | 0.986900 | 0.986900 | 0.986900 | 0.986900 |
| $\alpha_{net}$ (vapor/melt) $^{25}$Mg/$^{24}$Mg | 0.999106 | 0.999719 | 0.999719 | 0.987073 |
| $\alpha_{eq}$ (melt/vapor) $^{29}$Si/$^{28}$Si | 1.000617 | 1.000617 | 1.000617 | 1.000617 |
| $\alpha_{evap}$ (vapor/melt) $^{29}$Si/$^{28}$Si | 0.989800 | 0.989800 | 0.989800 | 0.989800 |
| $\alpha_{net}$ (vapor/melt) $^{29}$Si/$^{28}$Si | 0.998871 | 0.999379 | 0.999378 | 0.989985 |

| | | | | |
|---|---|---|---|---|
| D $^{24}$Mg gas (cm$^2$ s$^{-1}$) | 3.6015E+08 | 34585.07 | 36015.02 | 3.6015E+11 |
| D $^{28}$Si gas (cm$^2$ s$^{-1}$) | 1.8504E+08 | 17771.53 | 18506.30 | 1.8506E+11 |