# The liquidus surface in the system $CaCO_3$–$MgCO_3$ at high pressure: revisiting conditions for the minimum

S. ZHAO[1,2,*] , S. POLI[1], E. FRANZOLIN[3] AND M.W. SCHMIDT[3]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Milano, 20133 Milano, Italy
[2] Institute of Geophysics and Geomatics, CUG, Wuhan 430074, China (*correspondence: sky_zst@163.com)
[3] Institute of Geochemistry and Petrology, ETH Zurich, Zurich 8092, Switzerland

Phase relationships along the join $CaCO_3$-$MgCO_3$ received considerable attention as a reference system for melting of a carbonated mantle, although data on the location of the liquidus surface are very limited.

Multianvil and piston cylinder experiments were performed on mixtures of reagent-grade $CaCO_3$ and pure natural magnesite as starting materials, from 1150 °C to 1700 °C, at 3.5 and 4.2 GPa. Two Pt capsules were simultaneously loaded in each run, in order to assess internal consistency of solid-liquid relationships. A $Fe_2O_3$ sleeve close to graphite furnace was used to trap hydrogen diffusion to the capsule expected by Soret effect.

At 4.2 GPa, 100% liquid was bracketed at 1250°C for compositions at $X_{Mg}$ = 0.3 and 0.4 ($X_{Mg}$ = Mg/(Mg+Ca)). Although hydrogen diffusion cannot be excluded, complete melting provides a strong constrain on the liquidus surface. At 1250 °C, magnesite + liquid, and Mg-calcite + liquid were recovered for bulk composition $X_{Mg}$ = 0.6 and $X_{Mg}$ = 0.2, respectively. Magnesite + liquid field were found to occur down to 1225 °C. The solvus magnesite + dolomite has been intersected at 1200 °C for a bulk $X_{Mg}$ = 0.6. Subsolidus dolomite was found for bulk $X_{Mg}$ = 0.3, whereas dolomite + liquid occurs at $X_{Mg}$ = 0.35 in the same experiment, using paired Pt-capsules. At 3.5 Gpa, experiments suggest a larger temperature range for dolomite-liquid assemblage.

Byrnes and Wyllie [1] retrieved the minimum in the binary $CaCO_3$-$MgCO_3$ at 2.7 GPa, 1300 °C, and $X_{Mg}$ = 0.42., and Buob et al. [2] at 6.0 GPa, 1370 °C, and $X_{Mg}$ = 0.5. Because a positive dP/dT slope of the solidus is expected for most compositions in this binary, the new data we provide suggest an overestimation of melting temperatures in [1].

A preliminary thermodynamic model for the liquidus surface is explored here.

[1] Byrnes&Wyllie(1981) *GCA* **45**, 321-328. [2] Buob *et al.* (2006) *AM* **91,** 435-440.