Azeotropic Control of Plagioclase Crystallization: Implications for Basalt Generation

DOUGLAS R. SCHAUB*, TRISTAN CATALANO, HANNA NEKVASIL, AND DONALD LINDSLEY

Department of Geosciences, Stony Brook University, Stony Brook, NY 11794 USA (*correspondence: douglas.schaub@stonybrook.edu)

At elevated pressures, solidus temperatures in the anorthitic region of the plagioclase system are depressed relative to the expected near-ideal melting loop, the incongruent compound corundum appears above the solidus, and plagioclase crystallization is governed by an azeotropic topology [1]. This results in unexpected melt stability at elevated pressure, decompression crystallization rather than expected decompression melting, and the potential for formation of both highly anorthitic and more sodic assemblages during decompression [2, arrows in Figure 1].

Azeotropic behavior has been shown to extend to the pressure regime of basalt melt formation in the olivine-plagioclase system, with aluminous spinel replacing corundum as the crystalline product of incongruent melting [3, 4]. Experiments have indicated that the azeotrope in the olivine-plagioclase system shifts from ~An_{94} at 5 kbar to ~An_{91} at 7 kbar and $An_{<90}$ at 10 kbar. Further exploration of the system via equilibrium and dynamic cooling experiments will determine how the presence of olivine affects the topology in Figure 1 and implications for the genesis of mid-ocean ridge and subduction zone basalts.

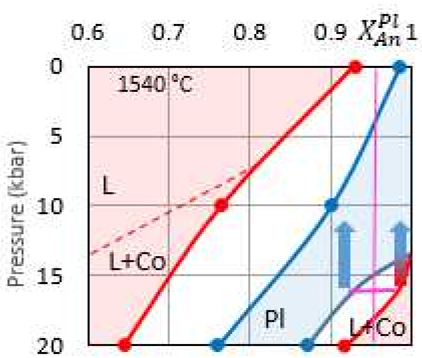

Figure 1: P-X of simple plagioclase system.

[1] Lindsley (1969), *New York State Museum and Science Service Memoir* 18, 39-46. [2] Nekvasil, Lindsley, Schaub, & Catalano (2017), *GSA Annual Meeting*, 305165. [3] Nekvasil, Lindsley, DiFrancesco, Catalano, Coraor, & Charlier (2015), *Geophysical Research Letters* 42, 10573-10579. [4] Catalano, Schaub, Lockwood, DiFrancesco, Nekvasil, & Lindsley (2017), *GSA Annual Meeting*, 305312.