

P-T formation conditions of pegmatites associated with the Taishanmiao granitic batholith, Henan Province, China: Constraints from melt and fluid inclusions

YABIN YUAN^{1,2*}, ROBERT J. BODNAR²

¹ MLR Key Laboratory of Metallogeny and Mineral Assessment, Chinese Academy of Geological Sciences, Beijing 100037, China (*correspondence:yabiny@vt.edu)

² Department of Geosciences, Virginia Tech, Blacksburg, VA 24061

The Taishanmiao batholith in Henan Province, China, is characterized by late-stage pegmatites that represent the final stages of crystallization of the batholith. In this study, fluid (FI) and melt inclusions (MI) in pegmatitic quartz were studied to constrain the P-T conditions of pegmatite formation. MI begin to melt at ~625°C when the heating path intersects the volatile-saturated solidus. Total homogenization of smaller MI occurs at ~780°C, but some larger MI still contain a vapor bubble at this temperature. Both H₂O and CO₂ have been identified in reheated MI, and their estimated concentrations are ~4.1 wt%, and 580-1300 ppm, based on analysis of the glass (H₂O) and vapor bubble (CO₂) by Raman spectroscopy. Assuming a trapping temperature of 780°C corresponds to a trapping pressure in the range 2.1-3.3 kbar using MagmaSat[1].

In some pegmatite quartz, MI and FI occur in the same assemblage, suggesting that the melt was volatile saturated and that the MI and FI were trapped on the volatile-saturated solidus. As such, the isochore for the aqueous phase must pass through the MI and FI trapping conditions[2]. Based on microthermometric data for the FI, the isochore was estimated using the model of Steele-MacInnis[3] for the H₂O-NaCl-CO₂ system. The upper limit for the trapping temperature (780°C) corresponds to a maximum trapping pressure ~3.9 kbar. Our results indicate that the Taishanmiao pegmatite began to form at ≤780°C and 2.1-3.9 kbar. These results are consistent with a pressure of ≤5 kbar previously estimated for formation of the Taishanmiao batholith.

[1] Ghiorso et al. (2015), *Contrib Mineral Petr* 169. [2] Student & Bodnar (1996), *Petrology* 4, 291-306. [3] Steele-MacInnis (2018), *Chemical Geology* 498, 31-44.