Plagioclase Mineral Chemistry of Basalt Rocks from the Black Mountain-Santo Thomas Chain in the Potrillo Volcanic Field

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In his 1971 study, Hoffer offered two hypotheses (1) the magma which erupted from the Black Mountain-Santo Thomas chain originated from the same source, and (2) after crystallization, olivine and plagioclase crystals had enough time to sit in the melt and separate with olivine settling and plagioclase floating before eruption. The Black Mountain-Santo Thomas Chain is a series of cinder cones and flows in the Potrillo Volcanic Field which includes Black Mountain, Little Black Mountain, San Miguel, and Santo Thomas. These cinder cones and flows are isolated from the rest of the Potrillo Volcanic Field, at about 13 km away from the nearest Potrillo Volcanic Field vents and other closely spaced cones. Minimal research has been conducted on this suite of cinder cones and flows, thus their relationship to each other and to the rest of the Potrillo Volcanic Field is poorly constrained. We collected samples from Black Mountain, Little Black Mountain, and Santo Thomas to analyze the plagioclase mineral chemistry and assess the mineral-melt equilibria. This strategy is two-fold: (1) analyzing the mineral chemistry of these two minerals provides information about the magma source, and (2) this new data will be compared to existing mineral data from the rest of the Potrillo Volcanic Field. Feldspar crystals separated from two samples at each location were analyzed using an electron probe microanalyzer (EPMA) from the University of Iowa. The anorthite contents of the plagioclase minerals range from An\textsubscript{56} to An\textsubscript{76}. While the existing feldspar mineral chemistry dataset is very sparse for the Potrillo Volcanic Field, these anorthite contents are very different from the existing range of An\textsubscript{27} to An\textsubscript{48}. Occasional reversed zonation observed in the plagioclase reflects a changing composition as the magma cooled before eruption and could suggest a recharge event or the incorporation of xenocrysts prior to eruption. The data was plotted against a feldspar equilibrium curve on a Rhodes Diagram. The diagram shows most of the plagioclase crystals did not grow in equilibrium and were above the equilibrium curve which suggests crystal accumulation. This supports Hoffer's second hypothesis of the olivine crystals settling at the bottom of the melt, leaving the plagioclase crystals to accumulate at the top melt and suggests that the plagioclase crystals spent a significant amount of time in the melt before erupting. More data would need to be collected to determine whether the magma originated from the same source. This study aids our understanding of young volcanism in New Mexico and allows for questions such as does the melt in the Socorro magma body have enough time to slow and settle before eruption and whether young magmatism in the region is characterized by longer residence times prior to eruption.

References:


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