Partitioning of Sr, Ba, Rb, Y, and LREE between plagioclase and peraluminous silicic magma

MINGHUA REN,* DON F. PARKER, AND JOHN C. WHITE†

Department of Geology, Baylor University, Waco, Texas 76798, U.S.A.

ABSTRACT

Trace-element partition coefficients between plagioclase and coexisting glass/matrix have been determined for twenty-nine rhyodacite-rhyolite samples from nine volcanic centers. Strontium partition coefficients form two clear positive trends when plotted against the An content of plagioclase. One trend has a steep slope with D_{Sr} between 5.6 and 15.8 (T1), whereas the other trend has a gentle slope with D_{Sr} between 1.2 and 7.6 (T2). Barium partition coefficients show similar patterns: a steeply sloped trend is formed by samples with D_{Ba} between 1.6 and 8.8, and a gently sloped trend by samples with $D_{Ba} < 1$. D_{Sr} and D_{Ba} in plagioclase correlate positively, and both D_{Sr} and D_{Ba} correlate positively with temperature. Samples with large D_{Sr} and D_{Ba} are all from rocks with <1 wt% CaO. These rocks are peraluminous and also have low total Sr and Ba. Partition coefficients for Sr and Ba are influenced by whole-rock CaO in high-Al rhyolite systems. Where these systems have low CaO, the opportunity increases for other divalent cations to enter the plagioclase structure. Strontium and Ba will then enter the M position of plagioclase to balance the charge deficiency caused by the substitution of Al for Si. Because of the potent influence of whole-rock composition on Sr and Ba partitioning for low CaO rocks, values of partition coefficients in petrogenetic modeling needs to be selected carefully.