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Thermal Expansion of Rubidium and Ammonium Feldspars

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The thermal expansion of buddingtonite (disordered $NH_4AlSi_3O_8$feldspar) and Rb-sanidine ($RbAlSi_3O_8$) have been investigated through X-ray powder diffraction measurements made at 1 atm between room temperature and 1100 ˚C using an Inel 4K-PSD position-sensitive detector at Cambridge University, UK. From the X-ray data it appears that buddingtonite begins breakdown (most likely the loss of ammonium) between 240˚ and 310˚C (evidenced by a sharp decrease in volume), then disappears completely in the temperature interval between 450˚ and 520˚C. The coefficient of thermal expansion calculated for Rb-sanidine is slightly less than that of K-sanidine (previously reported by Hovis and others, 1999, *The Canadian Mineralogist*), which itself is significantly less than that for disordered Na-feldspar (analbite; ibid). The thermal expansion coefficient for buddingtonite over the limited temperature interval from 20˚ to 240˚C is similar to those of K- and Rb-feldspar, but is less certain due to the limited temperature range. Clearly, the alkali-site occupant is critical to the thermal expansion in these minerals. A small-sized occupant of the alkali site apparently results in collapse of Al and Si tetrahedra around the site, which allows for expansion during heating. Feldspars whose room-temperature structures are already stretched to a large extent by the alkali-site occupant experience less tetrahedral collapse. This in turn limits thermal expansion.