THE ROLE OF WATER IN STRUCTURAL STATES OF K-FELDSPAR AS STUDIED BY INFRARED SPECTROSCOPY

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To examine the role of water in K-feldspar structures, infrared spectra have been taken on samples originating in water-rich environments. Spectral anisotropy in the range 3000 to 7200 cm^{-1} indicates that H_2O and OH^- are structurally accomodated by microclines from the Black Hills, S. D., Pala, Ca. and Spruce Pine, N. C. pegmatites. Heating of Pala microcline and feldspar with hydrous alteration confirms structural accomodation since absorbance by the microcline is not significantly reduced until 700 °C while sericitized feldspar loses 50% absorbance before 500 °C. Two combined H_2O stretching and bending modes (5263 and 5398 cm^{-1}) in the Pala sample (water content = 0.25 wt.%) indicate two water molecules with different hydrogen bonding environments. The anisotropy of the fundamental modes (3620, 3440 cm^{-1}; 3550, 3280 cm^{-1}) demands that the hydrogen atoms lie in a plane closely parallel to (001) and that the two-fold axes of the two types are not aligned with each other. Pegmatitic orthoclase from Madagascar, orthoclase from a late-stage miarolitic quartz latite dike at Bingham Canyon, Utah and sanidine from an ash flow tuff in Yellowstone Park, Wy. are devoid of significant absorption in the water region. Prince, et al, (1973) have determined by neutron diffraction that orthoclase associated with a microcline-bearing pegmatite in the Mesa Grande District, Ca. has no structurally bound water. The association of structural water with pegmatitic microclines and dearth of such water in the orthoclases suggests a role for water as a catalyst in the transition from monoclinic to triclinic feldspar. Differences in growth rates may determine whether K-feldspar incorporates water and then undergoes structural transition after cooling.