American Mineralogist, Volume 84, pages 550–554, 1999

Raman spectroscopic identification of B-free and B-rich kornerupine (prismatine)

BRIGITTE WOPENKA,[1,*] JOHN J. FREEMAN,[1] AND EDWARD GREW[2]

[1]Department of Earth and Planetary Sciences, Washington University, Campus Box 1169, St. Louis, Missouri 63130-4899, U.S.A.
[2] Department of Geological Sciences, University of Maine, 5790 Bryand Global Research Center, Orono, Maine 04469-5790, U.S.A.

ABSTRACT

This is the first application of Raman spectroscopy to the characterization of the kornerupine group of borosilicate minerals. Raman microprobe spectra were collected from ~100 to ~4000 cm^{-1} from 13 samples of kornerupines (from different localities) containing a wide range of boron content (0.02 to 0.84 boron atoms per formula unit of 21.5 O atoms). The Raman spectra of the kornerupines are consistent with the structure of the mineral as determined by X-ray diffraction (XRD) analysis, which locates the boron in a tetrahedron at the center of a trimer of corner-sharing tetrahedra and with the presence of only hydroxyl ions (OH) but no molecular water (H_2O). Two of the Raman vibrational modes of kornerupines (at ~803 Δcm^{-1} and at ~884 Δcm^{-1}) are sensitive to the presence of boron, and their relative intensities can be used to discriminate between kornerupine and prismatine. Based on the intensities of those boron-sensitive bands, the Raman spectroscopic technique could potentially provide a semi-quantitative measure of the boron content of kornerupine.