Characterization of glasses using infrared spectroscopy

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Amorphous silicate phases, such as glasses and weathering products, are ubiquitous on Earth and planetary bodies and can be identified using infrared spectra [1, 2]. We treat micro-reflectance Fourier Transform Infrared (FTIR) spectra with the Kramers-Kronig (KK) transform then deconvolve the resultant absorbance spectra using bands [from 3]. This method is used to identify and quantify structural units to better characterize the silicate glasses.

Synthetic and natural silicate glasses display a systematic shift in the overall FTIR KK absorbance peak maxima with increasing SiO_2 content (Fig. 1). Synthetic quartzofeldspathic glass spectra were deconvolved into bands and a relationship was found between the 1010, 1050, 1100, 1150, and 1210 cm^{-1} bands and Al/Si (Fig. 2). This method shows promise for extracting structural units from the IR spectra of multi-component silicate glasses, and for improving deconvolution of glass-mineral mixtures.

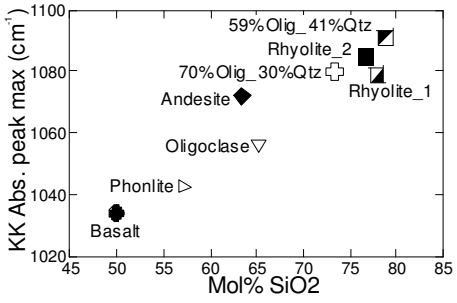

Figure 1. FTIR peak position (KK Abs; cm^{-1}) vs. SiO_2 content of glasses.

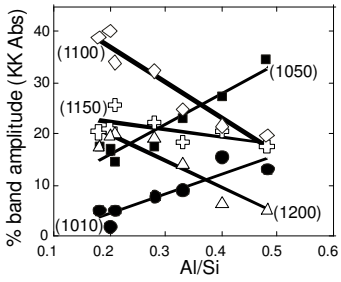

Figure 2. Percent band amplitude vs. Al/Si. Band positions (cm^{-1}) are in brackets.

References

[1] Michalski J.R., Kraft M.D., Sharp T.G., Williams L.B., and Christensen P. R. (2005) *Icarus* **174,** 161-177. [2] Wyatt M.B. and McSween H.Y. (2002) *Nature* **417**, 263-266. [3] Dalby K.N. and King P.L. (2006) *Am. Mineral*. (in press).