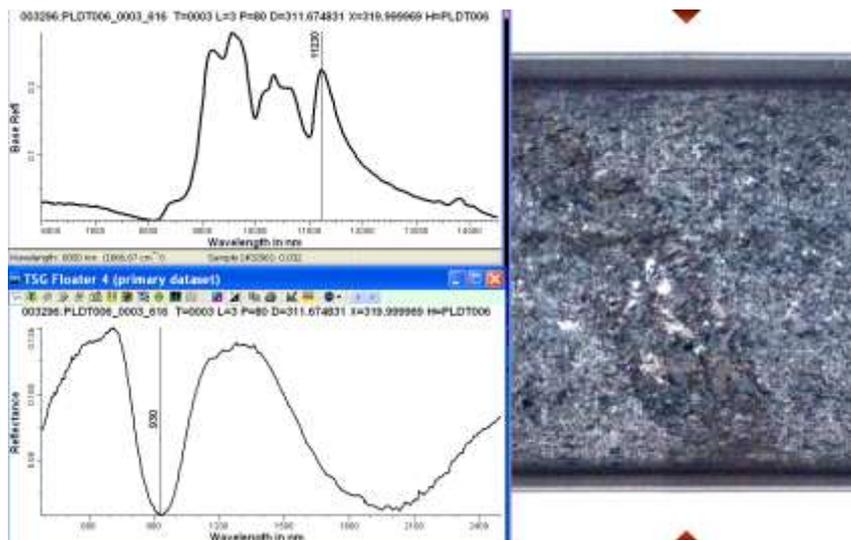


Extending the Pyroxenes in TSG  
Andy Green 11 November 2018

This note is motivated by a couple of recent experiences where I had difficulty modelling the spectra of some (probably low calcium) pyroxene rich rocks. The first was the gabbro that formed part of Evelien Rost's study of surface condition on TIR spectra<sup>1</sup>. This spectrum has a feature at 11.17 um that is difficult to explain with our current library and is only partly matched by a pigeonite (HS199.3B) from the USGS library.

The second comes from the WA hole [PLRCD006](#) (previously wrongly named PLDT006) which has the dubious distinction of being the most aspectral hole in CorStruth. Spectra from an especially pyroxene-rich sample are shown below. The spectrum is strongly reminiscent of other orthopyroxene spectra and is quite distinct from the typical two-band clinopyroxene shape. However, the feature at 11.23 um is not typical for the Mg-rich orthopyroxenes.

In the VNIR/SWIR the sample shows the typical two-band structure of orthopyroxenes and the location of the shorter-wavelength band (~930 nm) indicates<sup>2</sup> it is a Fe-rich species.

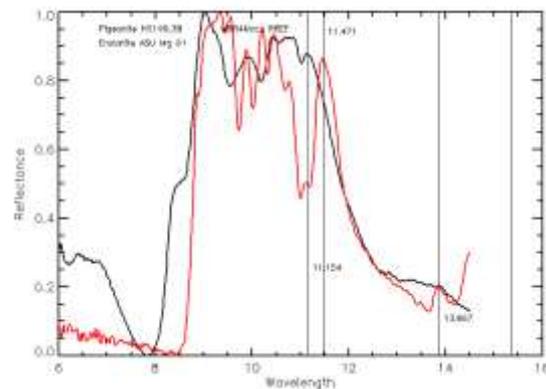
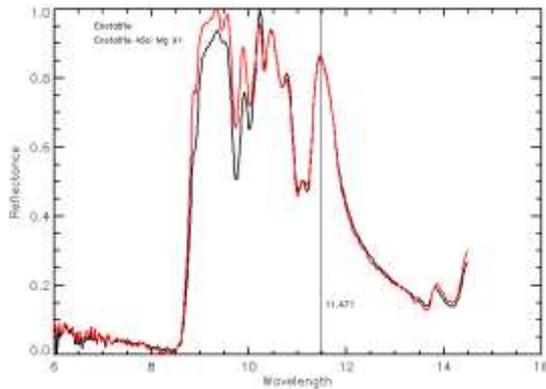


It would be very useful if we could know more about this pyroxene. Ideally I'd like to see some probe analysis to define its Ca/Mg/Fe proportions.

<sup>1</sup>Evelien Rost, Christoph Andreas Hecker, Martin C. Schodlok, .Freek D. van der Meer. Rock Sample Surface Preparation Influences Thermal Infrared Spectra, October 2018, DOI: 10.20944/ preprints 201810.0376.v1.

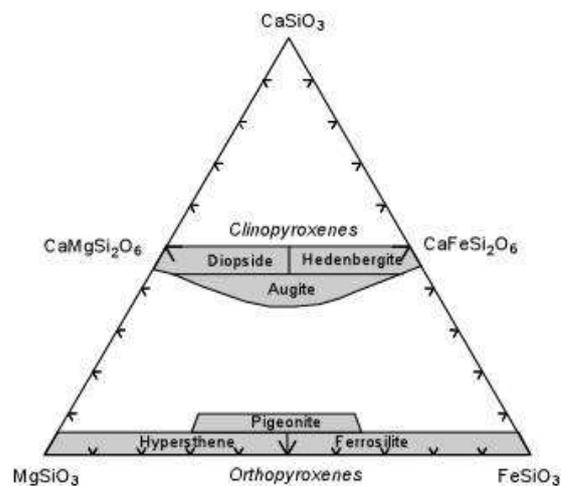
<sup>2</sup> Adams, J.B., Interpretation of Visible and Near-infrared Diffuse Reflectance Spectra of Pyroxenes and Other Rock-forming Minerals. In Infrared and Raman Spectroscopy of Lunar and Terrestrial Materials C.Karr Ed. Academic Press 1975.

Unfortunately, other than the HS199 sample, we don't seem to have any TIR spectra for iron-rich orthopyroxenes/pigeonites. The only orthopyroxene in our TSG library is labelled enstatite and is plotted below left (in black) with a high-Mg spectrum from the set of Hamilton orthopyroxenes<sup>3</sup>. The HS199 spectrum is plotted below right with the same spectrum.



All these Hamilton orthopyroxenes have the 11.47 um feature with nothing much around 11.2 um. It would be good to know more about the VNIR/SWIR and TIR spectra of the pyroxenes from the lower right corner of the pyroxene quadrilateral.

We seem to have plenty of clinopyroxene information but I think we need to include a few of the Hamilton orthopyroxenes with higher iron content and to get a better handle on pigeonite and ferrosilite.



<sup>3</sup>Thermal infrared emission spectroscopy of the pyroxene mineral series, Victoria E. Hamilton, Journal of Geophysical Research, vol. 105, no. e4, pages 9701–9716, April 25, 2000.