# Characterizing the effects of porosity and particle size on TIR olivine spectral features

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**Abstract**. Thermal infrared (TIR; ~ 3 - 50 µm) spectroscopy has been used to determine the chemical and mineral composition of planetary bodies for at least the past half-century[1]. The shape and position of spectroscopic features of a mineral are dependent on several parameters such as mineral chemistry, albedo, particle size, porosity, and near-surface thermal gradients[2-7]. On the Moon and other airless bodies of the Solar System very low gravities and the lack of atmospheric disturbances has resulted in porosities significantly higher than typical terrestrial analogs[5-6]. An increase in a sample's porosity results in less pronounced spectral features[3]. This decrease in spectral contrast is especially pronounced on airless bodies with discernable regolith on their surfaces[5-6]. Several studies have simulated high porosities in the laboratory; however, most studies have only characterized their samples using techniques that estimate the bulk porosity[2]. Thermal emissions from the lunar surface emanate from the upper hundreds of microns; thus, for our TIR measurements we require the porosity of the upper hundreds of microns[8]. Here we will characterize the surface porosities of a suite of olivine samples with various particle size distributions and packing styles using an optical imaging technique. These porosities will then be used to characterize observed changes in TIR spectral measurements of the samples.

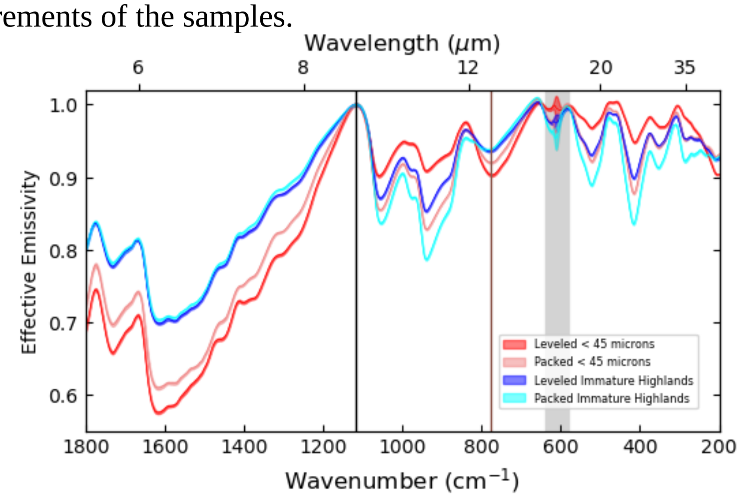


**Figure 1:** Spectra of San Carlos olivine samples prepared in two ways (leveled and packed) measured under ambient conditions.

[1]R.J.P. Lyon, *NASr-49(04)* (1964). [2]J.W. Salisbury and J.W. Eastes, *Icarus*, 64, 586-588 (1985). [3]J.W. Salisbury and J.W. Wald, *Icarus*, 96, 121-128 (1992). [4]A.L. Sprague et al. *Icarus*, 100(1), 73–84 (1992). [5]B.W. Hapke, *Theory of Reflectance and Emittance Spectroscopy*, p. 224 (1993). [6]W.D. Carrier et al., *In Lunar Sourcebook* p. 475–594 (1991). [7]K.L. Donaldson Hanna et al., *Icarus*, 283, 326–342 (2017). [8]B.G. Henderson and B.M. Jakosky, *JGR* 99 (E9), 19,063-19,073 (1994).