VISIBLE AND NEAR INFRARED REFLECTANCE OF MINERAL MIXTURES AND NANOPHASE IRON UNDER ANOXIC CONDITIONS. C. Legett IV[1], T. D. Glotch[1], V. B. Rivera-Banuchi[2], D. P. Moriarty III[3], S. M. Chemtob[2], and N. E. Petro[3], [1]Stony Brook University, Stony Brook, NY, [2]Temple University, Philadelphia, PA, [3]NASA Goddard Space Flight Center, Greenbelt, MD. (carey.legett@stonybrook.edu)

Introduction: Space weathering is the gradual alteration of materials when they are exposed to the space environment. On the surface of the Moon, these processes lead to the formation of nanophase (5-30 nm) metallic iron-bearing amorphous rims on lunar soil grains. These rims cause a decrease in albedo, a loss of spectral contrast, and may cause a "reddening" (or relative increase in reflectance with increasing wavelength) of the spectra compared to unaltered parent materials.

Methods: We prepared 70 two- and three-component mixtures of olivine, labradorite, halite, and nanophase metallic iron (hereafter referred to as Fe) under anoxic conditions and measured their visible and near infrared reflectance from 350-2500 nm. Resulting spectra were analyzed for changes in albedo, spectral slope, and band depth, and fit with parabolas and a two-part linear continuum (PLC) model and the Modified Gaussian Model (MGM).

Results: Figure 1 shows a two-component series of olivine and Fe. Spectra were collected of the pure endmembers and at 0.5, 1, 2, and 5 wt % Fe. Figure 2 shows the slope of the linear fit to each spectrum as well as the average reflectance value for each spectrum, as a function of weight % Fe.

Discussion: Preparing the samples and measuring the spectra in an anoxic environment prevented rapid oxidation of the nanophase iron particles, which would have strong effects on the VNIR spectral characteristics of the mineral assemblages.

In Figure 1 we can see both the characteristic darkening (decrease in average reflectance) and reddening (increase in reflectance with increasing wavelength) of the spectra upon addition of iron. The 0.5 wt % Fe spectrum has the steepest slope, with slope and average reflectance decreasing with further addition of Fe.

Conclusions: This work will allow us to constrain detection thresholds for each phase in both two- and three-component mixtures, and to quantitatively evaluate the changes in albedo, spectral contrast, and slope as a function of iron nanoparticle abundance.

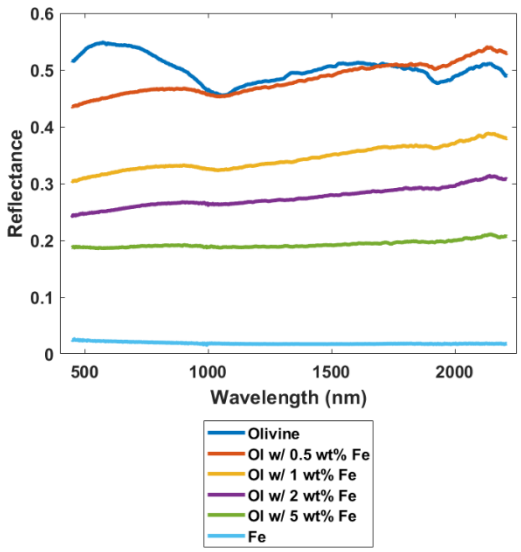

Figure 1. Reflectance spectra of Olivine and Fe mixtures.

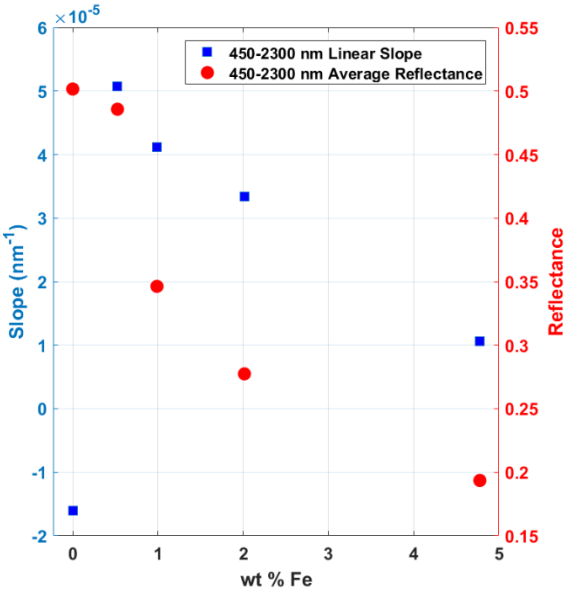

Figure 2. Linear slope and average reflectance vs wt % Fe of the spectra in Figure 1.