VNIR SPECTRAL EFFECTS OF POROSITY AND ALBEDO ON ASTEROID AND LUNAR ANALOG SAMPLES. M. Hernandez[1], A. C. Martin[1], K. L. Donaldson Hanna[1], [1]Department of Physics, University of Central Florida, Orlando, FL (ma040619@ucf.edu).

Introduction: Visible and near infrared (VNIR; 0.8-4.0 µm) reflectance spectroscopy is a fundamental tool with applications in various scientific fields, particularly in the study of the surfaces of airless bodies like the Moon and asteroids. Lunar regolith simulants are used to simulate known properties of regolith including composition, porosity, albedo, and particle size fraction. Here we examined the VNIR reflectance spectra of a suite of lunar and asteroid analog samples (Figure 1).

Methods: We produced and examined physical mixtures of San Carlos olivine, potassium bromide (KBr) and carbon black in the 45-125 µm and 0-45 µm particle size fractions. Olivine and KBr were ground and sieved using an agate mortar and pestle with a Gilson automatic sieve. These end members were then mixed using the following abundances: 0 wt.% KBr, 10 wt.% KBr, 50 wt.% KBr, and 90 wt.% KBr. As KBr is transparent in the MIR, it is used as a proxy for regolith porosity in that wavelength region. Carbon black was then added to each sample until a specific albedo was achieved as measured at 0.7 µm. Our target albedos were 15%, 10%, and 5% to match that of lunar regolith and primitive asteroids. Due to the challenges in precisely attaining target albedos, we allowed for an albedo range of ±0.5%.

We measured the albedo of each sample using a Thermo Nicolet iS50 Fourier Transform Infrared (FTIR) spectrometer using a PIKE Diffuse Reflectance Accessory. Using the OMNIC program successfully captured the background of the lab environment and conducted spectral analysis on our mixtures. VNIR spectra (as shown in Figure 1) were taken at Brown University's Reflectance Experiment LABoratory (RELAB).

Results and Future Work: We found that the samples with an increased KBr abundance (i.e. increased porosity) exhibit drastically different spectral signatures in the VNIR range. In particular, we noted these spectra have steeper slopes and reduced spectral contrast of the 1 µm absorption band compared to spectra of samples with lower abundances of KBr. In the future, we will look at MIR spectral trends, and we will analyze key diagnostic spectral features for the MIR range.

Our laboratory analyses will contribute to the understanding of how factors including regolith porosity and albedo change the resulting spectra. Such insights will be instrumental in interpreting telescopic observations of asteroid bodies, akin to those obtained from the James Webb Space Telescope (JWST).

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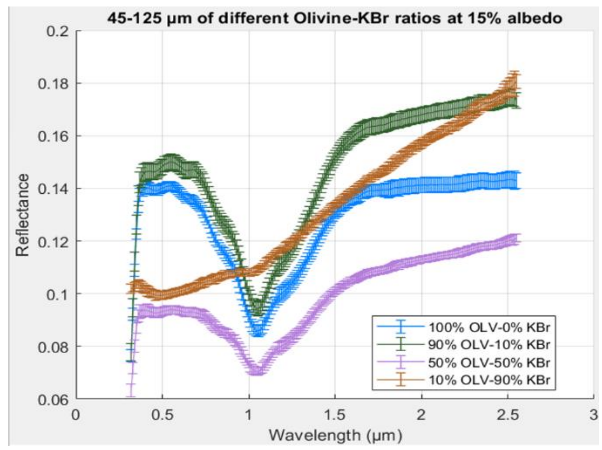

Figure 1: Example spectra of olivine and KBr mixture, with 15% albedos. The spectra correspond to their respective abundances of olivine and KBr as described by the legend.