HYDROXYLATION OF LUNAR SOIL WITH SOLAR WIND. Li Hsia Yeo[1], Jason McLain[2], and Rosemary Killen[3]. [1]NASA Goddard Space Flight Center, Greenbelt, MD (lihsia.yeo@nasa.gov), [2]NASA Goddard Space Flight Center, Greenbelt, MD (jason.l.mclain@nasa.gov), [3]NASA Goddard Space Flight Center, Greenbelt, MD (rosemary.killen@nasa.gov)

Introduction: Solar wind, which comprises high energy hydrogen ions, continuously strikes the lunar surface, which is rich in oxygen. This presents an opportunity for hydroxylation - the creation of OH on lunar soil [1]. Both OH and H_2O have been detected on the lunar surface, with some variability in abundance throughout the lunar day [2]. It is important to understand how space weathering contributes to the production and proliferation of hydrogen-bearing resources such as water within the lunar environment [3].

OH shows a distinct absorption feature in the infrared (IR) at ~3μm^{-1} that can be readily studied. Fourier Transform Infrared (FTIR) Spectroscopy is a fast and accurate way to detect changes in the infrared spectra of lunar soil. Previous studies have examined the changes in IR spectra of amorphous silica and olivine [4], as well as lunar soil [5] before and after hydrogen irradiation. However, the evolution of the OH band and other IR features has not been studied during hydrogen radiation itself. It is especially important to not expose the samples to terrestrial air, which will contaminate the samples with water.

Method and Results: We present FTIR spectra on Apollo-era soil samples obtained simultaneously with high energy hydrogen plasma irradiation, similar to the solar wind. Samples are first prepared by baking under high vacuum to drive off any surface water. Samples are also brought through thermal cycling and heated to 400 K (lunar dayside maximum temperature) in-situ, and changes in their IR spectra are reported. Comparisons between Apollo samples with different minerology and with a control of crushed SiO_2 are also provided. Results show broad but distinct growths in the 3 μm^{-1} absorption band for lunar samples compared to a sharper peak for SiO_2. Since the samples are not exposed to terrestrial water during measurements, and the experimental apparatus is continuously purged with nitrogen gas, the evidence of hydroxylation presented is likely due to hydrogen irradiation.

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