

ON THE PRESENCE OF UNWEATHERED LITHIC FRAGMENTS IN VIKING LANDER 1 SOIL  
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Viking Lander 1 color image 12I026 was acquired on Sol 652. The image shows a number of dark fragments and red clods on the X-ray Fluorescence Experiment funnel. The material on the funnel was taken from the tailings pile from the deep hole-2, a pile containing material excavated from between the surface and a depth of about 10 cm (1). The deep hole was dug between Sols 581 and 586 in an area where a shallow trench was dug earlier in the Mission. The dark fragments are approximately one centimeter wide. The largest fragment in the funnel is a red clod approximately 3 to 3.5 centimeters wide.

Radiance factor values were calculated for the red clods as well as for the dark fragments. Incidence, emission and phase angles for the funnel area are approximately 9, 50, and 45 degrees, respectively. Figure 1 shows radiance factor data for two of the red clods in the funnel. Photometric data acquired on Sol 611 were used to solve for the Hapke function (2) for soil patches at Lander 1 by Arvidson et al. (3). The fit to the soil data were used to compute radiance factor values at the lighting and viewing geometry of the funnel image. These results are also plotted in Figure 1. The soil patch values are about 5% higher than the brightest clod and about 12% higher than the medium red clod. These results are not surprising since the soil patch was probably covered with a thin layer of bright dust. Thus the clods are probably composed of typical indurated soils exposed at the site.

The radiance factor values for the dark fragments were also compared to the values calculated for two dark rocks at the Viking Lander sites. One rock, at the Viking Lander 2 site, is the most likely candidate for a mafic igneous rock yet located (4). The photometry of these rocks was calculated by Guinness et al. (5) and so we can again calculate the radiance factor values at the same lighting and viewing geometry as the funnel image. These corrected values are plotted in Figure 2, along with plots for two of the dark fragments in the funnel. The darkest fragment has a red radiance factor value that is 8% lower than the block from Lander 2, while the other dark fragment is very similar to the rock from Lander 2. The radiance factors for the rock at Lander 1 are 14 to 20% brighter than the dark fragments.

The computed radiance factor value for the darkest fragment (Figure 2) only reaches a maximum of about 0.1 for the red channel. This considerably narrows the laboratory candidates for a spectral match. For example, comparison to laboratory spectra acquired by Hunt et al. (6) show that the closest spectral match is a basalt with a relatively high magnetite abundance. However, any mafic or ultramafic composition with opaque phases would likely be a close match. The lithic fragments must have remained virtually unweathered to have such dark radiance factors, possibly because they were buried below the surface and were not exposed to surface weathering processes.

In conclusion, the material in the X-ray funnel indicates that the soil is a bimodal system, containing: 1) red clods, which are like soils that resemble ferric-rich amorphous materials, such as palagonites (5), and 2)

dark fragments, which are most likely mafic to ultramafic lithic fragments, with an abundance of opaque phases, such as magnetite.

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