

## THERMAL RADIATION PROPERTIES OF APOLLO 14 FINES

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The thermal radiation properties of lunar fines sample 14163 are presented for a wavelength range from 0.36 to 14.75  $\mu\text{m}$ . The spectral directional reflectance was measured between the wavelengths of 0.36 and 2.2  $\mu\text{m}$  and the spectral normal emittance from 2 to 14.75  $\mu\text{m}$ . These parameters were obtained for four densities from 1100 to 1600  $\text{kg}/\text{m}^3$  and the reflectance for angles of elimination from 15 to 60 degrees.

### Results

The spectral reflectance for a bulk density of 1600  $\text{kg}/\text{m}^3$  and for a wavelength range from 0.36 to 2  $\mu\text{m}$  is shown in Fig. 1. There are several prominent absorption bands in this portion of the spectrum. One band which has been found in almost every sample is that centered at approximately 0.95  $\mu\text{m}$ . Other bands appear at 1.3 and 1.8  $\mu\text{m}$ .

The visible appearance of this sample suggests a high reflectance. Compared with the Apollo 11 and 12 spectral reflectance results, the Apollo 14 fines reflectance is almost twice as large and this is no doubt connected with its composition. At a wavelength of 0.6  $\mu\text{m}$  and a bulk density of 1600  $\text{kg}/\text{m}^3$ , the reflectance of sample 10084 was 0.082, for sample 12070, 0.10 while for 14163, 0.18. For a wavelength of 2  $\mu\text{m}$  the reflectances were 0.186, 0.23 and 0.355, respectively.

The spectral emittance as a function of wavelength and bulk density of 1600  $\text{kg}/\text{m}^3$  is shown in Fig. 2. For the wavelength range used in this study there appears to be one absorption band near 6  $\mu\text{m}$  and at the Christiansen frequency (wavelength) between 8 and 9  $\mu\text{m}$ ; the region in the spectrum where minimum internal scattering takes place. The minimum emittance occurs near 3  $\mu\text{m}$  and is approximately 0.60 and the maximum near 8.25  $\mu\text{m}$  of approximately 0.97. Apollo 12 fines had values of 0.73 and 0.99 for the same wavelengths, respectively. In general, the spectral emittance of Apollo 14 fines is lower than those of Apollo 12.

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From these spectral reflectance and emittance results the solar albedo and total normal emittance have been calculated. The solar albedo for an angle of illumination of 15 degrees is 0.213. Those for Apollo 11 and 12 were 0.099 and 0.119, respectively, for the same angle of illumination. The total normal emittance as a function of temperature is given by

$$\epsilon(T) = 0.9696 + 0.9664 \times 10^{-4} T - 0.31674 \times 10^{-6} T^2 - 0.50691 \times 10^{-9} T^3$$
 for a temperature range from 80 to 420°K.

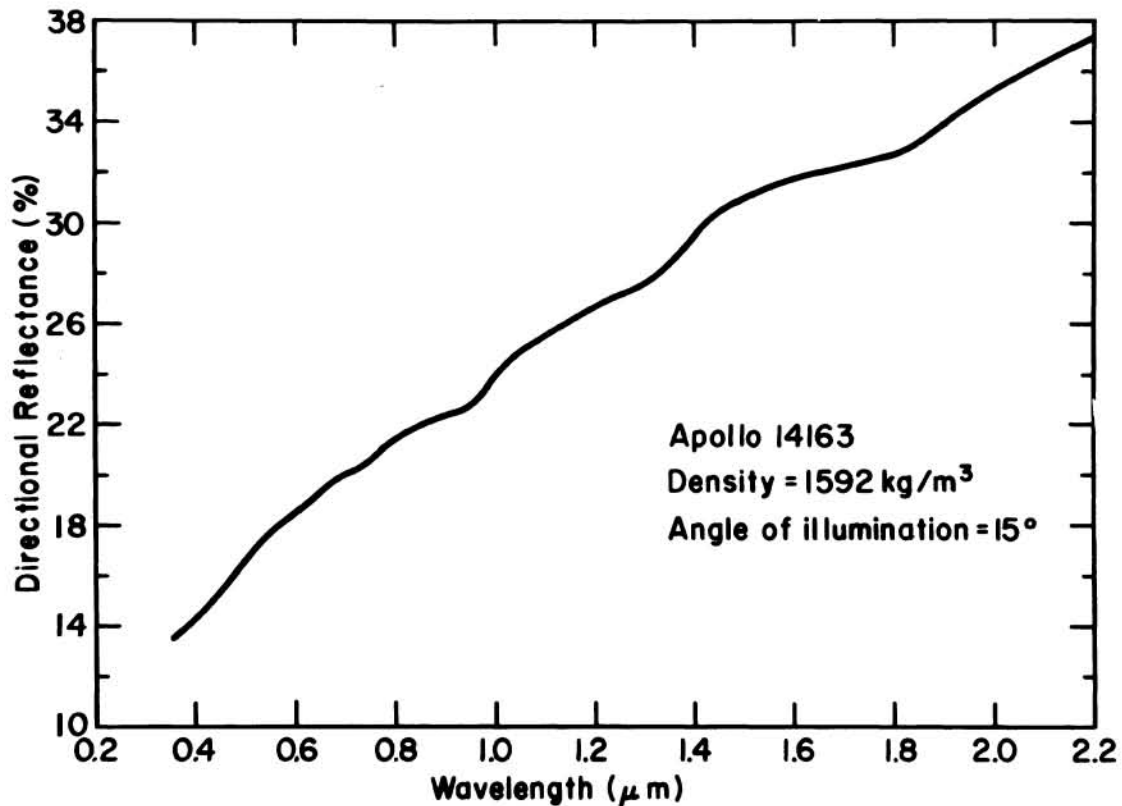


Fig. 1 Spectral Directional Reflectance of Apollo 14 Fines.

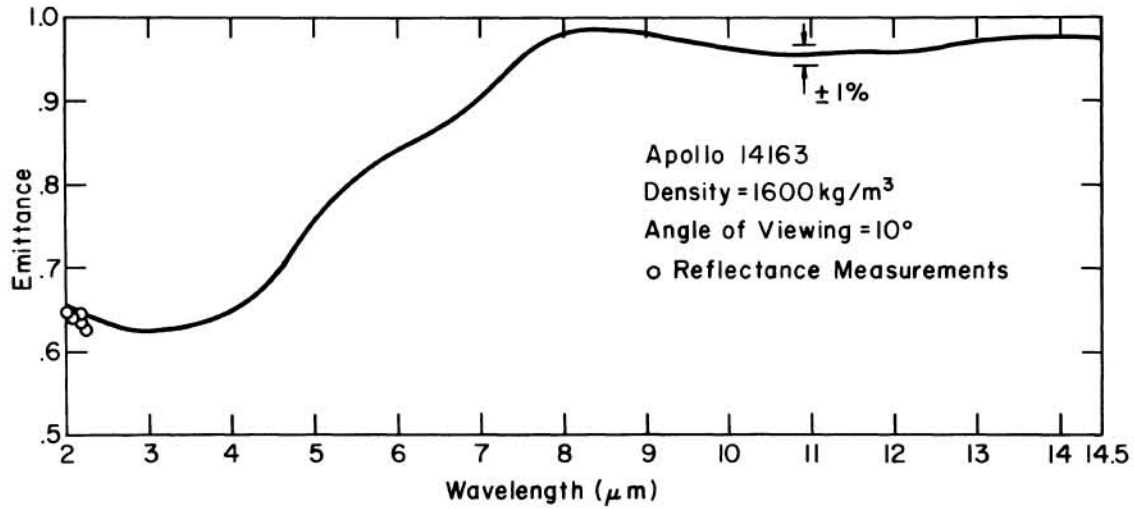


Fig. 2 Spectral Emittance of Apollo 14 Fines