LABORATORY INFRARED TRANSMISSION MEASUREMENTS OF INTERPLANETARY DUST AND IMPLICATIONS FOR REMOTE OBSERVATIONS OF COSMIC PARTICLES

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ABSTRACT

Laboratory infrared absorption spectra of interplanetary dust particles show that most fall into one of three spectral groups (1) designated as "pyroxenes", "olivines", and "hydrated silicates".

Comparisons with 10 μm emission data from Comet Kohoutek (2) show that no single spectral type matches the cometary data. However, a reasonable match is obtained by coadding equal amounts of pyroxene and hydrated silicate type spectra.

The possibility that the 10 μm feature seen in some comets is due to a combination of these two components can be tested in two ways. First, the pyroxene type spectra show detailed features of variable position and strength within their 10 μm bands. Based on the laboratory data we estimate that comet spectra taken at a resolution of $\lambda/\Delta\lambda \sim 200$ would be sufficient to find these features, if present. The magnitude of these features is expected to be ≤ 0.1 of the maximum strength of the 10 μm band.

Second, the hydrated silicate particles usually have bands at 3.0, 6.2, and 6.9 μm. The first two bands are probably linked to the presence of water while the 6.9 μm band is probably due to carbonates. The 3.0 μm feature is broad and might be hard to separate from thermal background. However, spectra taken at resolutions of $\lambda/\Delta\lambda \sim 50$ could see the 6.2 and 6.9 μm bands. The strengths of these bands (which are also seen in the spectra of CM meteorites) vary (one particle has a carbonate band that is actually stronger than its corresponding 10 μm silicate band), but are typically ~0.1 the depth of the silicate features. A second, narrow carbonate band at 11.4 μm can also sometimes be seen in particle spectra but its strength is less than that of the 6.9 μm band. This the search for the 6.2 and 6.9 μm bands in astronomical objects, while not requiring high resolutions, would require good S/N.

REFERENCES

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