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SPECTRAL CHARACTERISTICS OF DUST IN PLANETARY NEBULAE

N86-23516

H. Moseley and R. F. Silverberg

NASA/Goddard Space Flight Center

ABSTRACT

Some carbon-rich planetary nebulae exhibit a strong broad emission feature beginning at $\lambda \sim 24\mu\text{m}$ and extending to $\lambda > 30\mu\text{m}$ (Forrest et al., 1981). We present 30-55 μm spectrophotometry of IC 418 and NGC 6572, both of which have the strong broad emission feature. These observations allow us to define the wavelength dependence of the emissivity of the dust responsible for the feature.

Comparison with laboratory spectra of candidate materials which are likely to condense in a carbon-rich environment (Lattimer, Grossman, and Schramm, 1977), suggests that the feature arises from MgS (Goebel, 1980; Goebel and Moseley, 1984). Adopting this identification, we discuss the implications of such a strong feature arising from a relatively minor dust constituent.

Finally, we comment on the environment in which MgS may be found. We speculate that MgS will be seen in objects with C/O ratios only slightly greater than one, but not in extremely carbon-rich objects. In objects with much higher carbon abundances, e.g. BD+30⁰3639, the formation of CS consumes S so that insufficient MgS can form to exhibit the strong feature. These observations imply that the emergent far infrared spectrum of carbon-rich objects are very different depending on the abundance of the low temperature condensate MgS.