

SPATIALLY RESOLVED OBSERVATIONS OF THE UNIDENTIFIED DUST FEATURES IN  
BD +30°3639

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**ABSTRACT.** High resolution spatial scans through the planetary nebula BD +30°3639 have been made with the UCL cooled grating spectrometer at the IRTF. A spectral resolution of  $\lambda/\Delta\lambda = 50$  was sufficient to resolve the unidentified dust features at 8.6 and 11.3  $\mu\text{m}$  and separate them from the continuum emission. The scans were made in .7 arcsec steps across the nebula with a 1.8 arcsec diameter beam.

These results show that the emission from the 8.6 and 11.3  $\mu\text{m}$  features, the warm dust and ionized gas are all coextensive. In contrast the features in NGC 7027 arise from a shell around the ionized region and the region of 10  $\mu\text{m}$  continuum emission (Aitken and Roche 1982). A similar situation is also observed in the Orion nebula where the features arise at, or just beyond the ionization front south-east of the Trapezium (Sellgren 1981). These differences may be understood in terms of the nature of the ionizing source. In NGC 7027 the central star is extremely hot ( $\sim 300,000$  K) and  $\theta_1^c$  in Orion is of spectral type O4V; the exciting star in BD +30°3639 however is relatively cool at  $\sim 30,000$  K. Thermal spiking of small carbon grains, or polycyclic aromatic hydrocarbon molecules (PAH's), on absorption of single UV photons is thought to produce the 8.6 and 11.3  $\mu\text{m}$  emission features. The small grains however, are probably destroyed by the much more energetic photons found in the ionized zone around the star central to NGC 7027 and in the Orion nebula. In these sources the small grains or molecules only survive in the softer UV field outside the ionized regions, while the lower levels of excitation in BD +30°3639 allows the existence of PAH's in concert with the ionized gas, and warm dust. It appears that photons capable of triply ionizing sulphur ( $> 35$  eV) will destroy small grains, but the  $\sim 20$  eV photons required to singly ionize neon excite without destroying them.