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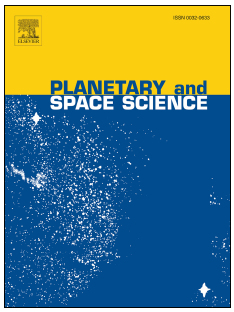

Carbon-rich dust from the asymptotic giant branch to planetary nebulae

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Carbon-rich dust from the asymptotic giant branch to planetary nebulae

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Abstract

As carbon stars evolve from the asymptotic giant branch to planetary nebulae, the spectrum from the dust around them changes from a mixture dominated by amorphous carbon to one dominated by polycyclic aromatic hydrocarbons (PAHs). Along the way, many other components appear, including SiC and MgS, aliphatic hydrocarbons, the still unidentified 21 μm emission feature, and fullerenes. The evidence from infrared spectral surveys suggests that the dust can form with layered structures, that aliphatics can co-exist with the PAHs in post-AGB objects, and that the appearance of the 21 μm feature is associated with aliphatics. Many uncertainties remain. Perhaps the most important is the composition of the amorphous carbon that dominates dust on the AGB, because different compositions can change the total dust output from carbon stars by nearly an order of magnitude.

Keywords:
carbon stars, AGB stars, planetary nebulae, dust

1. Introduction

I was asked to review the properties of carbon-rich dust from the asymptotic giant branch (AGB) to planetary nebulae (PNe). To complete this task, I have relied heavily on studies of the spectral properties of carbon-rich objects in the Magellanic Clouds and other nearby dwarf galaxies in the Local Group using the Infrared Spectograph (IRS; Houck et al., 2004) on the *Spitzer Space Telescope* (Werner et al., 2004). The spectra were obtained in