Infrared Emission from Planetary Nebulae with H-rich and H-poor Central Stars.

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We report on an investigation of the infrared properties of planetary nebulae (PNe) with H-rich central stars and with [WR]-type central stars ([WR] PNe) which certainly are H-poor. The infrared radiation comes mainly from the layers expelled at the AGB and can reveal the evolutionary history of the two groups.

In Fig. 1 a rather limited region is occupied by [WR] PNe which forms a stripe that presumably reflects their evolution. Objects with cool central stars (late spectral subtypes: [WC 11] to [WC 8]) have bluer IRAS colors than nebulae with hot nuclei do (early subtypes: [WC 6] to [WC 2]). An evolutionary sequence is also visible in infrared spectra of the objects. We have used results of Volk & Cohen (1990) who have classified a number of IRAS LRS spectra of PNe according to the morphological appearance. Spectra of the [WR] PNe apparently change from type P → R → L → H → E along the stripe. For PNe with H-rich central stars no evolutionary sequence of this kind can be identified.

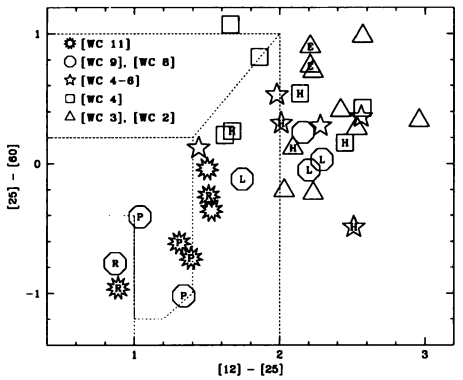

Figure 1: Locations of [WR] PNe in the IRAS color-color diagram.

We suggest that the evolutionary sequence visible in the IRAS color-color diagram can be drawn back to the AGB and that a link between [WR] PNe and carbon stars can be found. This is supported by the fact that about 30% of PNe with PAH emissions in IRAS spectra have [WR]-type central stars, while the proportion of [WR] PNe is only about 8% of the total number of PNe (Górny & Stasińska 1995). Presence of PAHs requires a high carbon content in dust forming regions. However, it is interesting that Górny & Stasińska (1995) have found that [WR] PNe have nebular C/O abundance ratio similar to the other galactic PNe, whereas carbon enrichment is expected for descendants of carbon-rich stars.

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REFERENCES

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