Neon Abundance in Hot Central Stars of Planetary Nebulae: A New Clue to Late Stellar Evolution

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Abstract

We propose to analyze archival HST spectra of a selected sample of central stars of planetary nebulae (CSPN) for which FUSE spectra are also available. The primary goal is to derive the neon abundance in their stellar atmospheres. While the abundances of most "hydrogen-rich" CSPN are well explained by evolutionary models, those of "hydrogen-deficient" CSPN are not. One explanation for the abundances of the latter is the "born-again" scenario, which predicts enhancements in carbon, oxygen, and neon resulting from a late helium shell flash. From recent modeling of far-UV and UV spectra with a revised version of the stellar atmosphere code CMFGEN which included high-ionization stages of neon, we discovered that in very hot (Teff > 80,000 K) CSPN, several transitions from high ionized neon may be visible at UV and far-UV wavelengths (Herald, Bianchi & Hillier, 2005). Our modeling shows that these features are highly sensitive to the neon abundance. We will model archival HST spectra concurrently with FUSE spectra to determine the stellar parameters such as effective temperature, and also the neon abundance. Our sample of hot CSPN spans a range of evolutionary phases. The neon abundance is an important clue to the chemical processing and subsequent dredge-up and mixing in the stellar atmosphere as predicted by the born-again scenario. Also, neon is a key component to understanding how CSPN contribute to the chemical enrichment of the surrounding ISM. This study will probe the late stages of stellar evolution with unprecedented diagnostics.

Investigators:

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Number of investigators: 2

Dataset Summary:

Instrument	No. of Datasets	Retrieval Method	Retrieval Plan
STIS	18	FTP	Data will be downloaded through the MAST website over the course of a few days.
GHRS	3	FTP	Data will be downloaded through the MAST website over the course of a few days.