30.02 Diffusion-Induced Hydrogen Burning in White Dwarfs, G. Fontaine, G. Michaud, Montreal. Even though diffusion tends to concentrate hydrogen at the surface of white dwarfs, the tail of the hydrogen abundance distribution extends deep enough for hydrogen to burn efficiently and quiescently in some of these stars. In the presence of nuclear reactions, the equilibrium abundance distribution is disrupted, and hydrogen is consequently forced to move downward and its concentration in the superficial layers must decrease. This mechanism offers a natural explanation for the absence of hydrogen in the atmospheres of helium-rich white dwarfs even if accretion of hydrogen-rich interstellar matter occurs onto these objects. It also bears on the spectral evolution of white dwarfs (in particular the transformation of some DA stars into DB objects), and the upper limit on the hydrogen content of ZZ Ceti stars consistent with the current theoretical understanding of their pulsation properties. Diffusion-induced hydrogen burning may also slow down considerably the cooling of white dwarfs. This work was supported in part by the NSERC Canada.

30.03 IUE Observations of Hot DA White Dwarfs, S.S. Finley, G.S. Basri, S. Bowen, U.C. Berkeley.

We report on 12 low dispersion spectra of DA white dwarfs known to be hotter than 20,000 K from their optical colors. These spectra were fit to the Berkeley model atmosphere code fluxes and effective temperatures for the objects were obtained in all cases but one. In this instance (UD309+10), we find that a self-consistent fit to the optical and FUV data cannot be achieved. We have also analyzed the IUE spectra of PG 1444-037, and its spectrum displays the same anomalous behavior as UD2309+10. Additionally, we have utilized the comparisons of our model atmosphere fluxes with the IUE spectra to significantly improve the relative accuracy of the IUE photometric calibration. This work was supported by NASA grant NAGS-69.


The hot DO star PG 1034+001 (T_eff=80,000K) is one of only two helium-rich white dwarfs which can be observed in the IUE high resolution echelle mode. We report here a preliminary analysis of our spectra of this object. Our SWP image reveals the presence of photospheric NV and CIV lines marginally detected in low dispersion spectra together with the first detection of oxygen (OV 1371) in the photosphere of a white dwarf. MMT high resolution observations and carbon and nitrogen abundances based upon model atmosphere calculations will be presented.

This work was supported by NASA grant NAGS-260, NSF grant AST 82-18624 and NSERC Canada.


An analysis of time-resolved (dt = 10.8s) spectrophotometry of the large-amplitude ZZ Ceti variable G29-38 is presented. The spectral range covered extends from 2300 A to slightly beyond 1 um. The obtained colors are shown to pulsate in phase, with the relative amplitude of color variations being largest in the blue. Some 436 individual energy distributions have been fitted with theoretical distributions obtained from a grid of blanketed, pure hydrogen model atmospheres appropriate for DA white dwarfs. The luminosity variations of G29-38 are totally accounted for by effective temperature variations only. An upper limit on the changes in surface gravity is \( \Delta \log g \leq 0.008 \). Evidence is presented showing that the spectrum is distorted during a pulsation cycle: it is not possible to fit in detail the effective temperature excursions with models having a uniform temperature across their surfaces. This potentially important result may eventually lead to the actual determination of the \( \delta \) index of the spherical harmonics that describe the surface geometry of linear, nonradial white dwarf pulsators. This work was supported in part by the NSERC Canada and in part by the NSF.


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30.07 The Peculiar X-ray Source AS431, J.-P. Caillault, G.A. Chanin, G.J. Helfand, J. Patterson, Columbia U., M. Nousek, L. Takalo, Penn. State U., G. Brown, U. Ottawa. In the course of a systematic survey to identify an X-ray flux-limited sample of late-type stars, we have discovered a highly reddened emission line star cataloged as AS431. The star has a significantly absorbed X-ray spectrum (\( N_H = 10^{22} \text{cm}^{-2} \)) and a flux in the 0.5-4 keV band of \( \sim 10^{-15} \text{ergs cm}^{-2} \text{s}^{-1} \). The intrinsic X-ray luminosity of the source is \( \sim 10^{34} \text{d} \phi \text{ (kpc)} \) ergs s\(^{-1}\). Spectroscopic observations taken with the 62" reflector of the Black Mountain Observatory reveal bright, broad Balmer emission lines (l=5896, l=6568, l=6758) which are nearly as bright as the Balmer emission lines. No clear photospheric absorption features are seen in the 5500 Å to 8000 Å band; although the interstellar Na D lines and \( \lambda \text{H} \) are broadened. Multicolor photometry carried out at Kitt Peak National Observatory yielded the following magnitudes: U=18.37, B=16.72, V=13.84, R=11.00, I=9.14. The extreme value of B-V=2.85, coupled with the width of cool dwarf absorption, implies substantial interstellar reddening. A visual absorption of \( \sim 7 \) magnitudes is required if the star is, in fact, an early-type main or post-main sequence object, as suggested by the emission line spectrum. However, the very bright near infra-red magnitudes (J=6.09, H=4.92, and K=3.95) indicate a more luminous object.