Analysis of Molecular Spectra in Asymptotic Giant Branch Carbon Stars

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Carbon stars are usually cool hydrogen deficient red giants with rich, carbon-abundant spectra. A comparison of C5 and C6 N-type stars was conducted to compare the spectral abundances of CN, C2, and C3 to observe which classification has a higher abundance of carbon compounds. A R~17000 Littrow spectrograph, 115mm apochromatic refractor, and cooled monochrome camera on a German equatorial mount (GEM) were used to image spectra for 21 carbon stars, between 6460 to 6630 angstroms. The spectra were stacked, processed, calibrated, and analyzed in IRIS, a self-made PixInsight script, and RSpec. Measurements of the lines of interest and their respective abundances were conducted. The measurements showed that C6 N-type stars had higher spectral abundances overall, with every single compound tested (CN, C2, C3) demonstrating a higher depth after band correction. This demonstrates that their characteristically lower temperatures facilitate the creation of these compounds. Knowing that lower temperatures allow for the formation of carbon compounds in N-type stars allow us to better relate these processes to our models of photospheric emission, essential in understanding stellar evolution.

Awards Won:
Second Award of $1,500