ON THE OPTICAL MOLECULAR EMISSION BANDS OF HD44179: THE RED RECTANGLE

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We have observed the Red Rectangle Nebula with the DENSPAK, multi-object spectrograph on the WIYN telescope. Moderate resolution spectra ($\Delta\lambda$ = 0.4 Å) in the region of 5800 Å were obtained in 1.5-arcsec circular apertures at over 90 positions in the nebula. Evidence for absorption was specifically sought and found in the RRB spectra taken within 9 arcsec of the star. The absorption was coincident with the emission, but in all cases showed a lesser degree of rotational excitation. The increasing amount of absorption toward the central object and across the X-shaped spikes suggests that the absorber lies in a torus surrounding the central source. The problem of the velocity profiles of the molecular lines was examined considering the line profiles of Na, C I, and CO, which are known to show several velocity components in absorption and emission near the central source. The equivalent width of the emission allowed the estimation of the oscillator strength of the transition in the RRB carrier. Additionally, variation of the peak wavelengths and the gross profiles of the 5800 and 5850 Å RRBs with distance from the star provide strong constraints on spectroscopic modeling of potential molecular candidates. We have begun such modeling for linear, prolate, and oblate carbonaceous clusters. This work may bracket the size of the molecule and the rotational excitation temperature.