THE MILLIMETER SPECTRUM OF CRL618 AND RELATED STUDIES ON PHYSICAL CONDITIONS

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CRL 618 is probably the best example of a C-rich protoplanetary nebula (PPNe) with a thick molecular envelope surrounding a B0 star and an ultracompact HII region from which UV radiation, by several orders of magnitude larger than that in CRL2688, impinges on the envelope. Its distance of 1.7 kpc makes this object one of the best suited for studying the evolutionary stages from the Asymptotic Giant Branch (AGB) to planetary nebulae. The brightening of the HII region in the 1970s and the discovery of high velocity molecular winds (HVMW) with velocities up to 200 kms^{-1} illustrate the rapid evolution of the central star and its influence on the circumstellar ejected material. From observations of molecular gas at arcsecs resolution, the high velocity molecular outflow and the slowly expanding envelope were resolved and precisely positioned around the ultracompact HII region.

The recent discovery in CRL618 of the polyynes HC_4H and HC_6H and of benzene (C_6H_6), the first aromatic molecule detected outside the solar system, stresses the fact that the copious mass ejection toward the end of the AGB phase, and the related shock and UV driven chemistry, make the C-rich nebulae of this type very efficient factories of organic molecules. Small hydrocarbons and pure carbon chains are formed that can be the small bricks from which larger C-rich molecules can be built, those widely accepted as responsible for the observed emission from the mid-IR Unidentified Infrared Bands (UIBs).

In order to draw the clearest picture of the chemical composition of CRL618 it is necessary to have complete line surveys in those regions of the electromagnetic spectrum where most molecules do emit. One of these line surveys has been carried out by us at millimeter wavelengths with the IRAM 30m telescope and is being currently extended to the submillimeter domain with the CSO telescope. The complete IRAM-30m survey will be presented and the physical conditions of different regions in the molecular outflows will be discussed based on these observations.