

MILLIMETER WAVE OBSERVATIONS OF CIRCUMSTELLAR ENVELOPES
WITH THE IRAM TELESCOPE

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We report various recent observations of molecules in circumstellar envelopes of late type stars, mainly possible proto-planetary nebulae at various stages of evolution, and supergiants, including :

- First observation of SO₂ (Lucas et al. 1986) in five stars and SO in one. SO₂ is particularly strong in OH 231.8+4.2 (OH 0739-14) and OH 26.5+0.6, where one of its lines is the strongest non-maser line observed in these envelopes (Guilloteau et al. 1986).

- Search for HCO⁺ with negative results in IRC +10216, but positive ones in OH 231.8+4.2.

- Observation of carbon rich molecules in oxygen rich envelopes. HCN observed in 8 stars is particularly strong in supergiants with massive shells (VYCMa, NMLCyg, IRC+10420, VXSGr) and in OH 231.8+4.2. In the latter, CS and HNC have a magnitude comparable to HCN ; CS is marginally detected in two others stars.

- Observation of various molecules in C-rich envelopes and in particular in CL 2688 and IRC +10216.

- Detailed studies of the particular bipolar nebula OH 231.8+4.2 including the detection of SO₂, SO, H¹³CN, HNC, CS, HCO⁺, OCS and thermal SiO, and a mapping of the 2.6 mm line of ¹²CO. The ¹²CO profile exhibits very broad wings (total width ≈ 200 km/s) and the spatial structure of a strong bipolar flow in agreement with the observation of Herbig-Haro like objects by Cohen et al. (1985).

- First millimeter wave observations of two high galactic latitude stars (HD 161796 and 89 Her) of F-supergiant spectral type with infra-red excess, which could be proto-planetary nebulae, and of a few other very cold and peculiar envelopes of IRAS stars, including the high galactic latitude stars SAO 163075 and IRC-20101.

These results have various implications on the structure and the kinematics of these objects, the chemical processes and the elemental abundances, and their evolution and nucleosynthesis.

References

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