Highlights of Spanish Astrophysics VII, Proceedings of the X Scientific Meeting of the Spanish Astronomical Society held on July 9 - 13, 2012, in Valencia, Spain. J. C. Guirado, L.M. Lara, V. Quilis, and J. Gorgas (eds.)

Molecular complexity in envelopes of evolved Oxygen-rich stars: IK Tauri and OH231.8+4.2

L. Velilla Prieto[1], C. Sánchez Contreras[1], J. Cernicharo[1], J. Alcolea[2], M. Agúndez[3], J.R. Pardo[1], V. Bujarrabal[2], F. Herpin[3], K.M. Menten[4], and F. Wyrowsky[4]

[1] Centro de Astrobiología (CAB-CSIC-INTA)
[2] Observatorio Astronómico Nacional (OAN)
[3] Laboratoire d´Astrophysique de Bordeaux (LAB)
[4] Max Planck Institut für Radioastronomie (MPIfR)

Abstract

During the late phases of low-intermediate mass (0.1 to 8 solar masses) stars, a significant mass loss is produced creating a gas and dust envelope surrounding the central star. Due to the physical conditions in the envelope, gas is primarily molecular, placing these objects as efficient molecular factories that will enrich the interstellar medium. Observation and study of molecular emission allows deriving physical and chemical properties of these envelopes. As far as today, Oxygen rich objects are not so well studied as their Carbon counterparts, because Carbon chemistry is much more active than Oxygen chemistry. Importance of this work is that the Oxygen rich envelopes are not completely characterized yet. We present preliminary results from our on-going milimiter wavelength survey with the EMIR receivers of the IRAM 30 meters radiotelescope towards the envelopes of two evolved Oxygen rich objects: IK Tauri and OH231.8+4.2. We detect a wealth of lines ranging from few mK to K (with rms ranging from 1 to 3 mK in best cases). Both objects present significant differences in their molecular emission features due to contrast of evolutionary stage and physical properties and both show evidences of different chemical formation processes. Some of the molecules identified are CO, SiO, H_2O, NS, HCO^+, SO, SO_2, SH_2, OCS, HCN, HNC, CN, HC_3N, CS, H_2CO, $HNCO$, $HNCS$, SiS, N_2H^+ and a number of isotopologues (bearing ^{13}C, ^{33}S, ^{34}S, ^{17}O, ^{18}O, ^{28}Si, ^{29}Si, ^{30}Si and ^{15}N atoms). Some of the molecules identified represent first detections in Oxygen rich AGB stars. We expect to get a better understanding of the chemistry and structure of these objects, in particular how interaction between AGB (Asymptotic Giant Branch) envelopes and post-AGB winds influences chemistry producing a reformation of molecules through shocked gas reactions.