Collisional and reactive processes of astrophysical interest: On the importance of having accurate molecular data

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The Herschel telescope and the ALMA interferometer open new windows of observation for wavelengths ranging from far infrared to sub-millimeter with spatial and spectral resolutions previously unmatched. To make the most of these observations, an accurate knowledge of the physical and chemical processes occuring in the interstellar medium (ISM) is essential. In this presentation, I will show what are the current needs in astrophysics in terms on molecular data and how accurate data are a crucial parameters for the determination of physical conditions in molecular clouds.

In particular, I will show how new collisional data for the HCN/HNC isomers, two of the most abundant molecules in the ISM, have allowed to revise the abundance of the two isomers in cold molecular clouds and how collisional data for the CN^- anion have allowed to confirm the presence of this negative ion in the ISM. I will also show how accurate rate constants for the $F+H_2$ reaction have allowed a more accurate determination of the gas density in diffuse ISM. Finally, I will show how first principles calculations can predict the existence of new molecular anions and how we predict the existence of the N_2H^- anion.

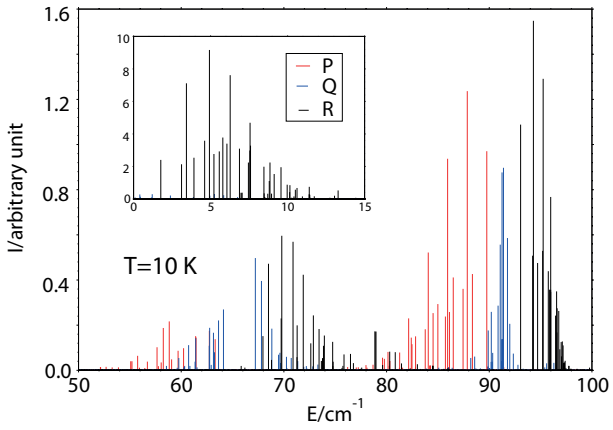

Figure 1: Microwave and far-infrared spectra of the N_2H^- complex.