PL03

Photophysics and chemistry of carbon macromolecules and clusters of astrophysical interest in a cold FTICR cell

Christine Joblin • *CESR, Université Toulouse 3 - CNRS, Observatoire Midi-Pyrénées , Toulouse, France*

The nature of interstellar polycyclic aromatic hydrocarbons (PAHs) is an intriguing problem for the astrochemist and the chemical physicist. These species play a major role in the physics and chemistry of the interstellar medium (ISM). However, the PAH hypothesis suffers from the lack of identification of specific molecules. The exact nature of interstellar PAHs has therefore to be explored by studying the processes that lead to their formation, their destruction and their chemical evolution in astrophysical environments.

In order to tackle this question, we have developed the experimental set-up PIRENEA, "Piège à Ions pour la Recherche et l'Etude de Nouvelles Espèces Astrochimiques". The challenge is to approach in the laboratory the physical conditions that prevail in interstellar space: cold environment (10-50 K), absence of collisions on long timescales and presence of stellar far-UV photons. The central part of PIRENEA consists in an ion cyclotron resonance (ICR) cell that is connected to cryogenic shields. In the ISM, processes occur on long timescales and involve infrared radiative cooling, photodissociation in low energy channels, and radiative association. I will show how we can study these processes using PIRENEA, showing results that have been obtained on PAHs, PAH clusters and complexes of PAHs with heavy atoms such as Fe. I will also discuss the spectroscopic diagnostics that are developed in the UV-visible and in the IR. These diagnostics are important for a direct comparison with astronomical spectra but are quite challenging to set up.