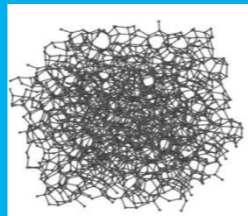
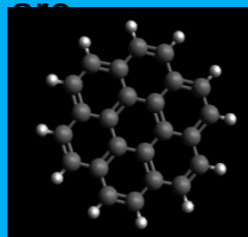


FORmation of MOlecules in the InterStellar Medium: An Experiment in laboratory astrophysics

Abdi-Salam MOHAMED

Polycyclic Aromatic hydrocarbons (PAH)

In the astrophysical context, several types of carbonaceous solid particles are observed. In particular, the large polycyclic aromatic hydrocarbons PAH (polycyclic Aromatic Hydrocarbons) supposed to represent up to 20% of galactic carbon. They are therefore supposed to represent a large fraction of the carbonaceous cosmic dust grains. Large polycyclic aromatic hydrocarbons are examples of such carbonaceous grains of molecular cosmic dust. PAHs are organic molecules of which the cyclic structure comprises at least two aromatic rings.

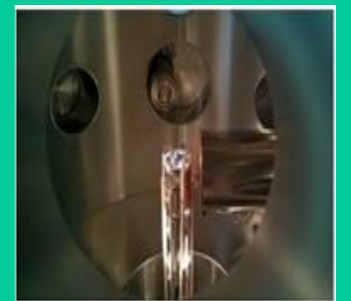


Why do a lab experiment?

It is therefore necessary to conceive a specific device for the student, under the conditions likely to be encountered in the interstellar medium.

The following elements are required:

- An ultra-empty enclosure (because cloud densities are very low and avoid "pollution").
- Sample holder
- Realistic surfaces (graphite, ice, silicates ...)
- A way to characterize the reactions (QMS, RAIRS, laser ...)



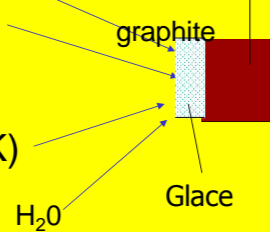
A typical experience

1 UHV

In a stainless steel enclosure, the vacuum pumps make it possible to obtain a vacuum of 10^{-10} mbar, ie more than one thousand billion times less molecules than in the air. This ensures that we study only the molecules that are introduced in the enclosure and places us in conditions compatible with the space (there is no air!).

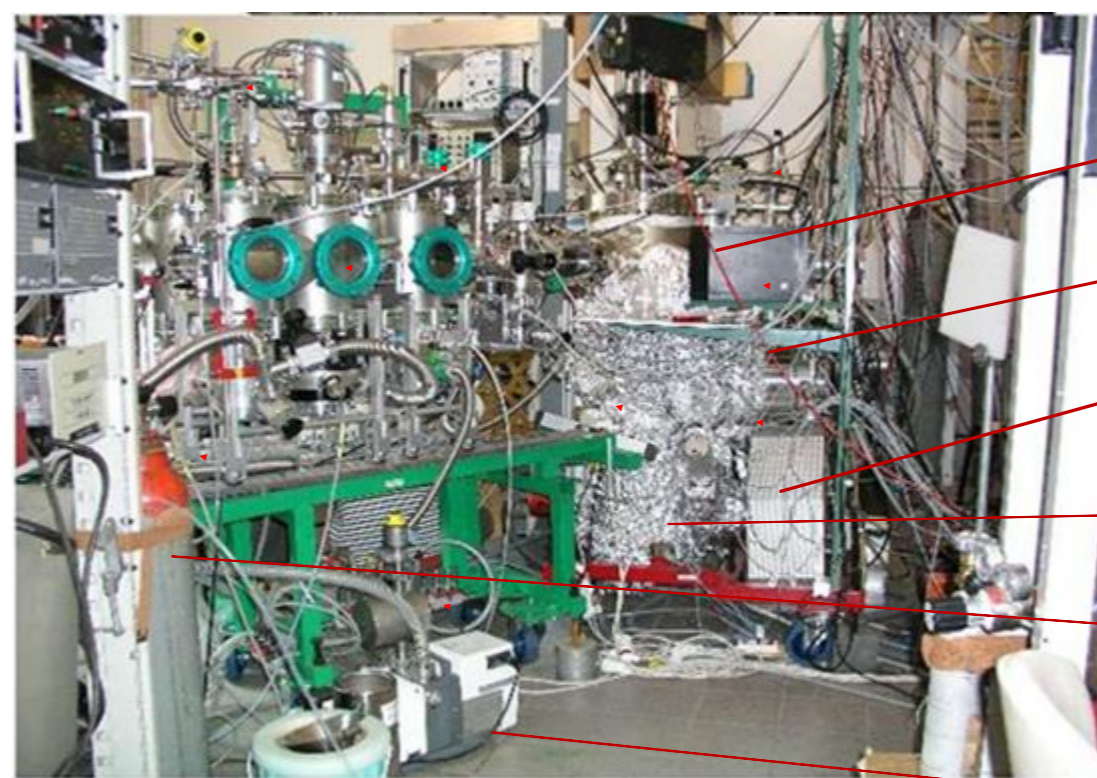
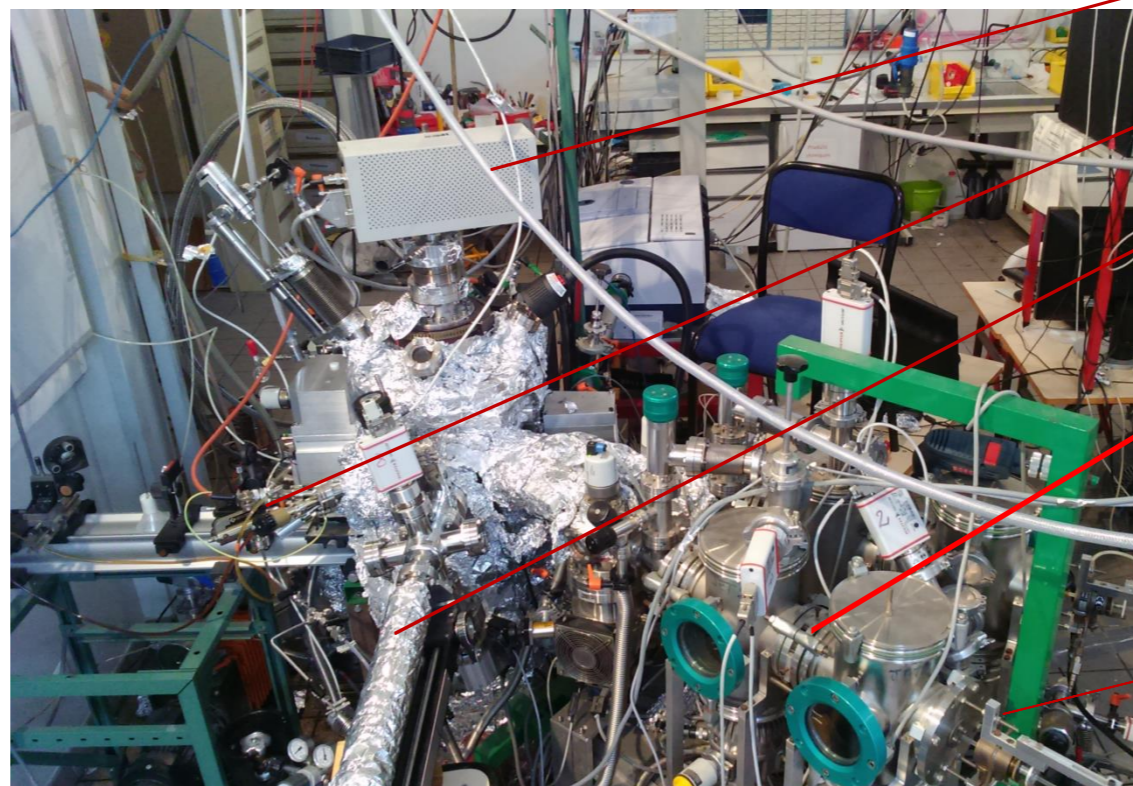
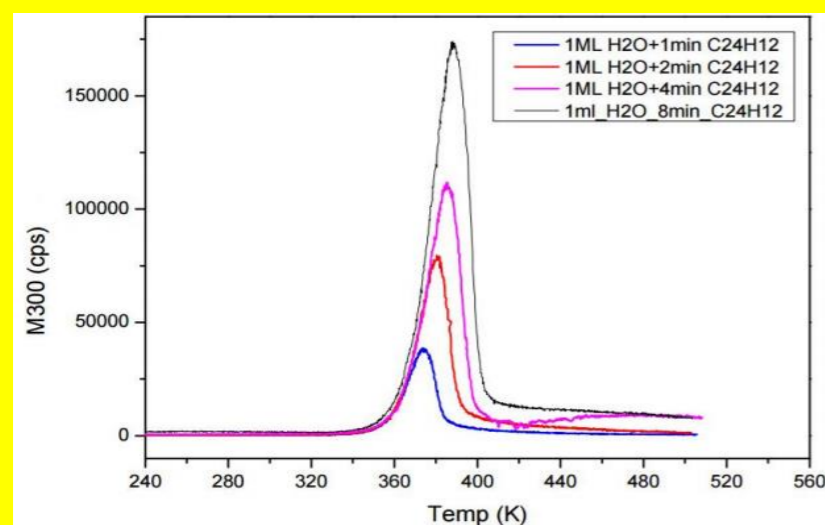
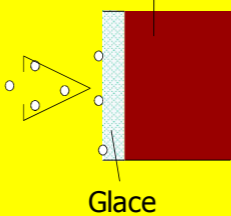
2 The ice sample is formed

Water vapor is deposited
On the cold sample port (10K)
It forms ice.



3 Atoms are sent which can react

We start the Coronene jet
(PAH source).
the molecule Evaporates (480K)



Expérience "FORMOLISM" 2017

LERMA UMR 8112 Université de Cergy-Pontoise

• Quadrupole Mass

• Atomic source

• Source PAH

• Beam

• Surfatron

• Sample Holder

• Turbomolecular pumps

• Ionic Pump

• Packaging for stoving

• Bottle of dihydrogen

• Primary pumps

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