The chemistry of protoplanetary disks: searching for the building blocks of life

Linda Podio[1]

Protoplanetary disks are the birthplace of planets, therefore their molecular content determines the chemical composition of the forming planetesimal which will then assembly to form planets, asteroids and comets.
Observational surveys of disks in the millimeter and sub-mm range routinely detected simple molecules (e.g., CO, CN, HCN, HCO^+), while more complex molecules remain hidden on the icy mantles covering the dust grains in the mid-plane and in the outer disk regions. Recently observations with the *Herschel* satellite and with the ALMA interferometer allowed us to detect for the first time two essential ingredients for life: water and complex organic molecules (COMs).

First, I will show *Herschel* observations revealing for the first time cold water vapour in the outer regions of protoplanetary disks, implying a mass of water ices up to 100 Earth masses.
Then, I will show how ALMA started to revolutionise our comprehension of the disk chemistry allowing the detection of complex organic molecules in disks, such as c-C_3H_2, HC_3N and CH_3CN. Moreover, ALMA allows us to study the disk chemistry at the very first stages of the star formation process, i.e. in Class 0 protostars.
Finally, I will discuss how future facilities, such as ALMA-band 2 and SKA will allow us to search for larger COMs and pre-biotic molecules, such as Glycine, in protoplanetary disks.

[1] INAF - Osservatorio Astrofisico di Arcetri, Florence, Italy