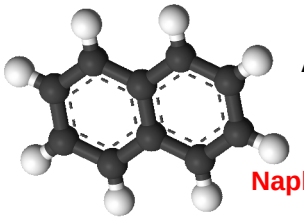


Naphthalene $C_{10}H_8$

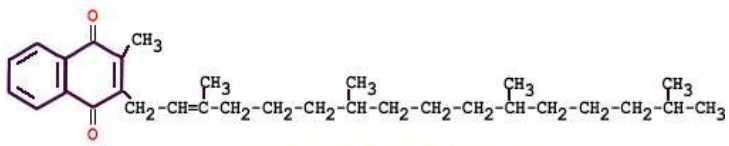
Aditional Information about of the detection of naphthalene cation, $C_{10}H_8^+$

1.- Significance of the result

The naphthalene molecule is among the most complex molecules so far identified in the interstellar medium. It is formed by 10 carbon plus 8 hydrogen atoms distributed in a rather particular configuration. The carbon atoms conform 2 hexagonal rings surrounded by the hydrogen atoms. This ring configuration is important because carbon hexagons enriched with oxygen and nitrogen atoms form an essential part of the DNA, of the genetic code of life. In this sense to study where and how these carbon rings can form and combine to produce other molecules can lead us to understand the first steps in the construction of basic molecules for life.

Recent experiments with naphthalene, water and ammonia ices , these two molecules are very frequent in many regions of the interstellar médium- show that at the very low temperatures of the interstellar medium and illuminated by UV radiation produce chemical reactions that originate 13 out of the 20 amino acids known on Earth.

Moreover, naphthalene in the presence of water ice and under UV radiation produces naphthoquinones. The quinonas are pentagonal molecules with five carbon atoms and two hydrogen atoms. They have been detected in meteorites. Derivatives of the naphthoquinones produce the K vitamine or co-enzime Q.



Vitamina K1 fillochinone

credits:http://ar.geocities.com/codexdevitaminas

There is evidence supporting the existence of these molecules in meteorites. Meteorites are pieces of material from the primitive stages of formation of the Solar System which populate the interstellar medium and fall continuously on Earth. Some theories propose that the Earth was formed as a consequence of numerous impacts of big meteorites several billion years ago.

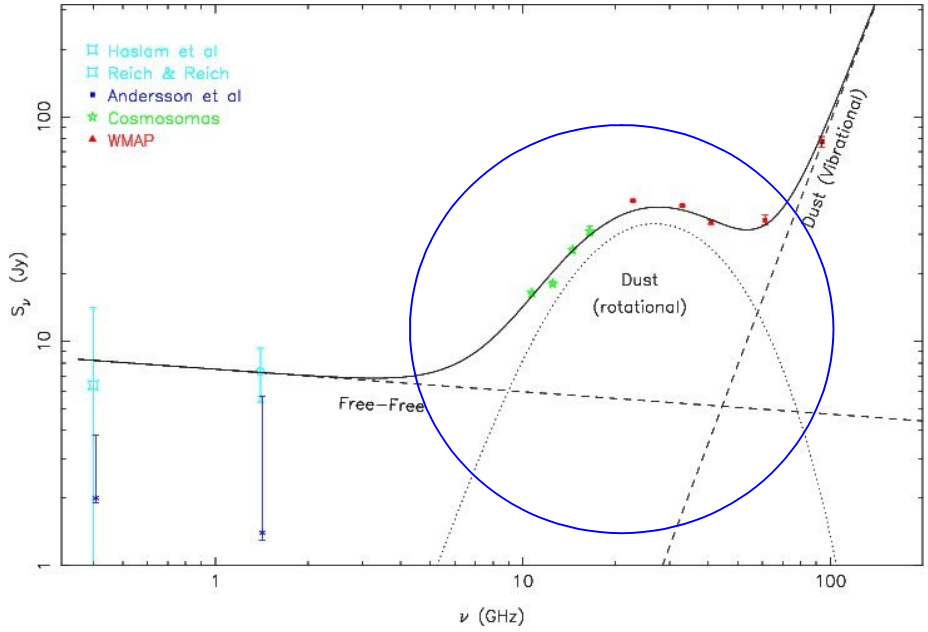
Our work points out that complex organic molecules detected in meteorites could already have existed in the interstellar material from which the Sun formed and therefore have an origin in a previous phase. The connexion between organic chemistry at the interstellar medium and organic materials in meteorites is not fully demonstrated yet but our work adds support to it. The presence of complex organic molecules in the interstellar medium and not only in the material of the Solar System suggests that these molecules named prebiotic- i.e. molecules which are precursors of the building bricks of the genetic code - could be very common in the Universe. Our work opens a door toward new research on the complexity of the chemistry of the interstellar medium which may lead to a better understanding of the processes which produce key molecules for the development of life.

2.- How was detected naphthalene in the Interstellar Medium?

Observing the radiation emitted by one star in the Perseus molecular complex located in a region of anomalous microwave emission . We expected to detect specific characteristics of the emitting molecules in the visible spectrum of light. Molecules as any product in a supermarket can be characterized by a barcode which allow to distinguish them. In the case of molecules the code is given by the absorption of light or emission of light that the molecule produces. Our work identified absorptions characteristic of the naphthalene molecules in the Perseus region. We have detected “barcodes”, designated bands, in the same region, but the only molecule that we can identify at present is the naphthalene because its code is best measured in the laboratory. Very likely other more complex molecules exist but their characteristic barcode have to be much better measured in laboratory so a confident identification can be proposed.

3.- What is the anomalous microwave emission?

The anomalous microwave emisión is a new process of microwave radiation detected in our Galaxy. Microwaves are electromagnetic waves with wavelengths of order a few centimetres to few millimetres. The COSMOSOMAS experiment of the IAC (located at Teide observatory) has shown that there are regions of significant anomalous emission in the so-called Perseus molecular complex at approximately 700 light years from Earth. Models proposed by scientists at Princeton university (USA) suggest that this radiation could be caused by hydrogenated carbon based molecules which would spin around their axes at several billion cycles per second. The fast spinning electric charges in these molecules would the produce the microwave radiation



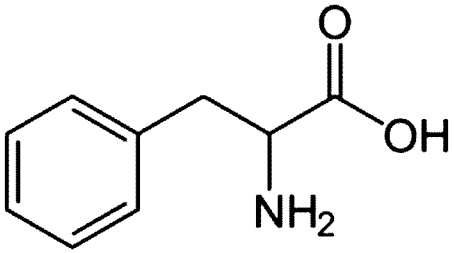
(Watson, Rebolo et al. 2005)

4.- What is the origin of this anomalous issue?

It has not yet been able to clarify, but its origins is possibly due to molecules that rotate very fast, more than ten billion of times per second and have a slightly skewed electric charge distribution , and which causes an emission of electromagnetic waves in just this range of a few centimeters to a few millimeters.

Aminoacid

- In chemistry, an amino acid is a molecule containing both amine and carboxyl functional groups. In biochemistry, this term refers to alpha-amino acids with the general formula $H_2NCHRCOOH$, where R is an organic substituent.[1] In the alpha amino acids, the amino and carboxylate groups are attached to the same carbon, which is called the α–carbon. The various alpha amino acids differ in which side chain (R group) is attached to their alpha carbon. They can vary in size from just a hydrogen atom in glycine through a methyl group in alanine to a large heterocyclic group in tryptophan.



Phenylalanine is one of the standard amino acids.

Credits : http://en.wikipedia.org/wiki/Image:Phenylalanin_-_Phenylalanine.svg

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