

Characterization of organic molecules in Martian analogue samples: Implications for Mars exploration

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The study of Martian analogues on the Earth is important for the understanding of the possible processes that could happen in the Mars' surface. In this sense, the characterization of organic molecules in analogue samples is important due to the fact that their presence could evidence the possible existence of life in the history of Mars.

In the present research work, samples from the Enekuri outcrop (Biscay, Spain) were analysed. Samples were taken from inside the outcrop to avoid modern contamination compounds. This geological formation is located in the Basque-Cantabrian Basin, near Bilbao (North of Spain) and was formed during the Late Albian period. Enekuri outcrop is an emplacement of submarine volcanic origin characterized by basaltic rocks (pillow lavas) and for that reason it has been chosen as a possible Martian analogue.

For the organic molecules detection ToF-SIMS (Time of Flight-Secondary Ion Mass Spectrometry) was employed. The samples were analysed by a commercial linear ion trap mass spectrometer coupled to a laser desorption at NASA GSFC, which is an analogue instrument to the MOMA (Mars Organic Molecule Analyzer) instrument on board of the ESA ExoMars 2020 rover.

The obtained results revealed the presence of organic molecules in the samples. Apart from the inorganic fragments originated from silicates, aminoacids and aromatic fragments were identified in localized areas of the samples. Due to the probable similar geological characteristics of Enekuri and Oxia Planum or Jezero crater basaltic outcrops, these findings are interesting since they can help in the comprehension of how these compounds can be formed in this type of geological formations (whether they have a biological origin or not) and therefore, explain the existence of organic molecules related to life in the red planet.