# Searching for Biosignatures in Mars by Differentiation of LIBS Molecular Signals

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If there was life in the past on the Red Planet, specific biosignatures might still be present only if preservation conditions have been favourable for them [1]. The recognition of the habitable past on Mars increases the exigency to identify and characterize modern analogues of these surroundings and to evaluate the mechanisms that can conserve biosignatures in them. The processes that originate and safeguard possible organic-type biosignatures in mineral phases are of crucial interest [2]. In the last few years, Laser-Induced Breakdown Spectroscopy (LIBS) has emerged as a powerful tool with an essential role in space exploration since it combines many of the required features for this application [3]. Although, in essence, LIBS can provide elemental information of a material, it has been shown to be a potent instrument for identifying and discriminating different types of organic compounds based on their intrinsic spectroscopic characteristics [4]. The classifying of these materials associated to optical emission signal from molecular emitting species such as CN, C2, NH, CH and OH, among others, can be affected by the atmosphere surrounding the laser-induced plasma [5]. In this particular application, the $CO_2$-rich Martian atmosphere implies that the effect could be reduced, whereas other species formation processes attributed to dissociation of $CO_2$ and subsequent recombinations in plasma may occur. Some investigations have reported the difficulties of detecting organic compounds, in the presence of a carbon and oxygen rich atmosphere. In this sense, the formation mechanisms of emitting species of organic and C-containing inorganic compounds under Mars-like atmospheric conditions using LIBS have been evaluated.

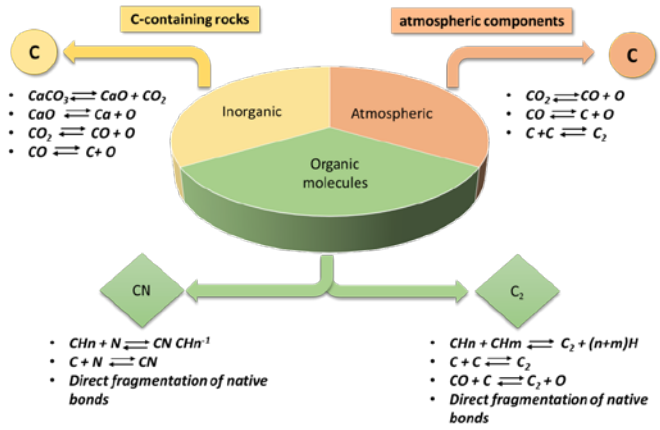


**Fig. 1. Possible pathways to produce emitting species from organic and C-containing inorganic materials in $CO_2$ atmosphere**

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