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Study of Martian Organic Molecules Irradiation and Evolution: The Momie Experiment

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The life on Mars remains an open question despite the Viking landers results and the ALH84001 possible terrestrial contamination. However recent data of Mars Express orbiter and the twin rovers Spirit and Opportunity seem show different proofs of a past environment with liquid water and mild temperatures favorable for life. Among the biomarkers we seek, the organic molecules are primordial because they are necessary to the origin of life as we know it. However, these molecules (except methane recently discovered) have never been detected on Mars by the in situ analyzes of the Viking landers. A key question is to know if organic molecules are indeed present, in which concentration and under which form. Indeed, even if endogenous organic molecules were never synthesized, those brought by exogenous sources, like interplanetary dust, should be present in detectable amount. Moreover, the track of the endogenous organic molecules should not be dropped out because these molecules are able to resist over periods of several billion years without being degraded. It thus appears that organic molecules could be present at the surface of Mars, even if they have significant chances to undergo a partial or total chemical evolution. Within the framework of a search for organic molecules by present or future space experiments, we are developing the MOMIE project (Martian Organic Material Irradiation and Evolution) in order to determine how the organic species evolve on the Martian surface. We thus propose to implement this type of research with the assistance of an experimental setup designed for the study of the behavior of organic molecules under conditions simulating as close as possible conditions of Mars surface. We present here the impact of the solar UV radiations reaching the Mars surface on various carboxylic acids of astro-

biological interest for Mars. Results indicate that the benzoic and oxalic acids do not resist if directly exposed to UV radiations whereas the mellitic acid could generate UV resistant organics. The formation of such products could contribute to presence of organic matter into the Mars soil.