
Simple biochemical methods for the detection of life-inhibiting peroxidants and life signatures on Mars-like soils

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Abstract

One of the principal objectives for planetary exploration is the search for traces of past life and evidence of conditions that may have supported life or indeed which may inhibit the emergence of future life. Such analytical approaches often rely on the detection of specific markers (i.e. biomolecular signatures) and require the development of highly specialised methods and complex automated analytical platforms. The high cost of a such missions is matched by the high risk of failure (i.e. mechanical failure, crash landing, loss of vehicle during launch, loss of contact, instrument failures, etc). Development of simple, highly specific, and conclusive assays with a minimum number of steps would mitigate many of the risks and improve the efficacy of such explorative tests. Astrobiological research is also oriented in Mars-like soil samples on Earth which provide an analogue for experimental design and simulation. In this study, we present methods to quantify the accumulation of life inhibitors such as metal superoxides and peroxides in Mars-like desert soils. Furthermore, we present methods that could be used in the development of conclusive tests for biomarkers of life that serve as signatures. The long-term goal of this work is the development of a fully automated platform for future exploration missions.

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