

EJC 2022 Workshop: Influence of pH and salts on the DMF-DMA derivatization for GC-MS analysis of potential bioindicators on extraterrestrial surfaces (Mars, Titan, Europe, Enceladus,...).

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For *in situ* Gas Chromatography - Mass Spectrometry space analyzes, pH and salts (e.g., chlorides, sulfates) can enhance or inhibit the detection of targeted astrobiological molecules. We observed on Mars recombination of organic molecules with salts (mainly perchlorates) during Sample Analysis at Mars experiments onboard the Curiosity rover (*Mars Science Laboratory* mission) (Freissinet et al., 2015; Millan et al., 2020, 2022; Szopa et al., 2020). Indeed, salts and pH may generate side reactions, but salts also influence the ionic force, may create salt complex or mask basic ions in the sample (hydroxide ion, ammonia, etc...) (Bretti et al., 2020; Ming et al., 2009; Permyakov, 2021). In future space missions, one of the GC-MS pre-treatment is based on an organic reagent used to volatilize polar or refractory organic molecules, called dimethylformamide dimethyl acetal (DMF-DMA), which has the capability to derivatize acidic groups in organics, such as amine and carboxylic functions in amino and carboxylic acids, or nucleobases, without modifying their chiral conformation (Freissinet et al., 2010). The influence of pH and a diversity of salts present in extraterrestrial surface samples on the DMF-DMA derivatization is still understudied. In this presentation, we observe the influence of different salts, or different pH on the DMF-DMA derivatization for various potential bioindicators (amino acids, fatty acids, and nucleobases). First, salts influence differently the derivatization yield, according to the organic and the salt studied. Second, monovalent salts regardless of pH allow a higher or equal recovery of organics compared to divalent salts, and basic pH solutions. Considering the overall negative effect of the salts on the detection of organics using DMF-DMA derivatization, future space missions may have to consider a desalting step prior to derivatization and GC-MS analyzes.

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