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Sample preparation on future space missions for *in situ* gas chromatograph-mass spectrometer analyses of molecules with astrobiology interests

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Dragonfly (rotorcraft lander) (1)

Investigations for:

- Prebiotic chemistry
- Habitability
- Potential presence of biomolecules

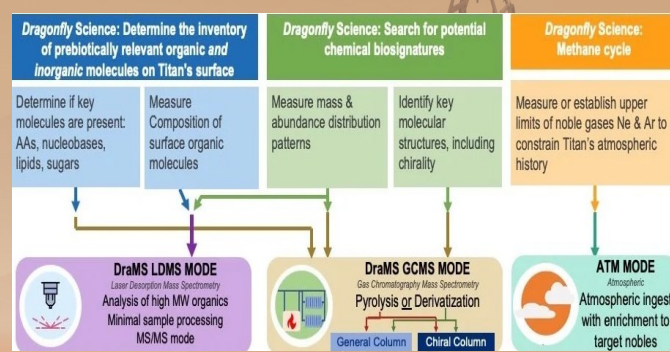
Instruments:

- **DraGMet:** Geophysics & Meteorology Package (APL, JAXA Lunar-A seismometer) (2)
- **DraMS:** Mass Spectrometer (GSFC, CNES) (2,3)
- **DrACO:** Drill for Acquisition of Complex Organics (Honeybee Robotics) (2)
- **DragonCam:** Camera Suite (MSSS) (2)
- **DraGNS:** Gamma-ray Neutron Spectrometer (APL, LLNL, GSFC, Schlumberger PNG) (2)

DraMS (Laser Desorption / Gas Chromatograph - Mass Spectrometer)

Investigations for:

- Bioindicators and biosignatures (4,5)
- Chiral compounds (6)
- Isotopic fractionations

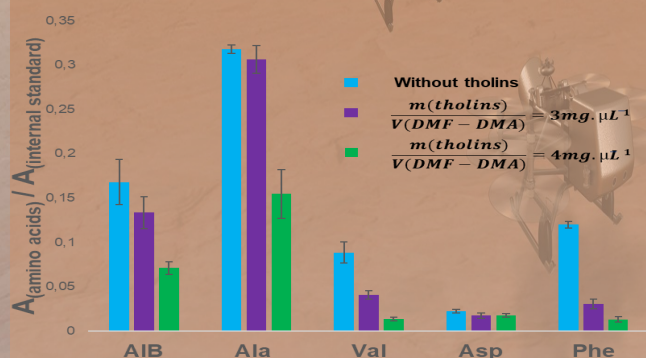


DMF-DMA derivatization

Interests using DiMethylFormamide DiMethyl Acetal:

- Methylation/Amidification of acidic functions
- Conservation of the chiral conformation
- Derivatization at 145 °C (for 3 minutes)

Result:



Conclusion:

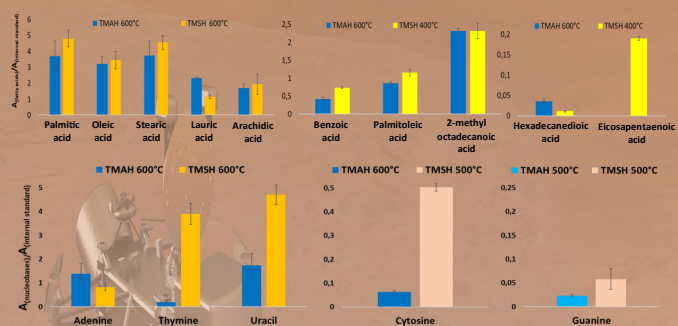
Maximal ratio (analyzed mass sample over DMF-DMA volume) of $4 \text{ mg} \cdot \mu\text{L}^{-1}$: detect rich and trace level organics.

TMAH/TMSH thermochemolysis comparison

Interests using TetraMethylAmmonium Hydroxide or TriMethylSulfonium Hydroxide:

- Methylation for all labile functions
- Derivatization as 200 up to 600 °C (for 10 seconds)

Results:



Conclusions:

- TMSH allows a higher or similar detection for targeted organics with low by-products' number and abundance.
- TMSH represents a promising reagent for search of amines without inter-comparisons or cross-contaminations.

Conclusions

- Trace amount of bioindicators among rich organic samples are detected with these sample preparations.
- The derivatization reagents chosen for DraMS experiments is able to detect wide range of bioindicators.

Acknowledgements

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