TIME-OF-FLIGHT MASS SPECTROMETRY FOR IN SITU ANALYSIS OF BIOSIGNATURES ON ICY BODIES A. E. Southard[1], S. A. Getty[3], J. E. Elsila[3], J. Ferrance[2],M. P. Espiritu[3], C. A. Kotecki[3], M. A. Balvin[3], J.P. Dworkin[3], D. P. Glavin[3], P. R. Mahaffy[3], [1]University Space Research Association (Adrian.e.southard@nasa.gov), [2]J2F Engineering, [3]NASA Goddard Space Flight Center

Introduction: Liquid-phase analysis, such as liquid chromatography, is an important analytical technique capable of identifying and characterizing biologically relevant organic species, such as amino acids and nucleobases [1-3]. The advantage of liquid separation techniques lies in their sensitivity limits and mitigation of thermal alteration mechanisms that can mask organic composition in the use of analytical ap-proaches such as pyrolysis. Recent breadboard devel-opment activities have focused on the design and proof-of-concept testing of liquid chromatograph-ion spray components to be compatible with time-of-flight mass spectrometry in rarified exospheres, such as that of Europa.

The Organics Analyzer for Sampling Icy Surfaces (OASIS) LC-MS [4] is optimized for streamlined *in situ* liquid chromatography that employs isocratic elution and derivatization-free methods. An ion spray interface to a reflectron time-of-flight mass spectrome-ter will allow mass identification of eluted compounds to assign molecular structures, including chirality, with high confidence. An example mass spectrum of organic standards, electrosprayed from a microfabricated LC chip, is shown in Figure 1.

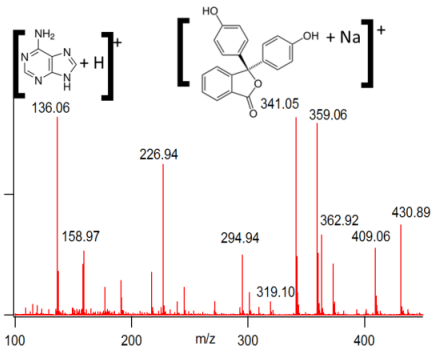

Figure 1 Adenine and phenolphthalein in a sodium formate buffer are detected by electrospray TOF-MS in OASIS component testing.

The OASIS breadboard design emphasizes the importance of compact, low-mass resource requirements, minimal consumable requirements, simple operations, and compatibility with microgravity environments.

Methods: While electrospray is traditionally done at atmospheric pressures, electrospray under at lower pressures relieves requirements on gas flow and can allow for more direct flow into the interface to a mass spectrometer[5]. However, stabilizing the spraying mode and preventing corona discharge remain active areas of research[6]. Interfacing the electrospray source to a mass spectrometer requires careful attention to losses in sensitivity due both to inadequate drying of sprayed droplets and efficient transmission of ions. This can be accomplished using ion guides.

Summary: OASIS aims to execute a focused investigation into the presence of biomolecular building blocks and the search for evidence of structural preferences that are expressed in known extant biology. Liquid chromatography is compatible with a range of astrobiologically relavent compounds including amino acids, nucleicobases and organic acids.

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