NASA SBIR/STTR Technologies

Non-Toxic Ionic Liquid Fuels II – X10.01-9473

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Identification and Significance of Innovation

ORBITEC is developing new, non-volatile liquid ionic rocket fuels and the associated thrust chamber asseblies. This new generation of hypergols will reduce risk and cost in storable liquid bi-propellant propulsion systems used in a range of applications.

Technical Objectives and Work Plan

In the Phase II work, ORBITEC synthesized new ionic liquid fuels, characterized their properties, and demonstrated their performance in small thrusters. This work involved the following tasks:

- Synthesis produced ~ 15 ionic liquid fuel candidates
- Tests measured viscosity, density, surface tension, thermal stability, impact sensitivity, and ESD sensitivity .
- Calculations predicted ideal performance of the fuels
- Droplet ignition tests identified 3 fuels that ignited with nitric acid in < 10 ms.
- Microreactor tests investigated the liquid phase reactions.
- Iterative design produced injectors and chambers to facilitate combustion of the new fuels.
- Hot-fire tests demonstrate the use of these fuels in thrusters.

NASA and Non-NASA Applications

This research program produced a set of fuels that are simultaneously high performance and non-toxic. These fuels will have application not only in NASA's propulsion systems but also in a range of military tactical , missile defense , and commercial launch systems.

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