Technology Readiness Level: 4
Component and/or Breadboard Validation in Laboratory Environment

Eltron Research & Development

Tech Brief

Highly Durable Catalysts for Ignition of Advanced Monopropellants

The integrated high payoff rocket propulsion technology (IHPRPT) program seeks to substantially increase capabilities in rocket propulsion. Increased monopropellant performance is also a propulsion objective. However, this increased performance requires improved igniter capabilities. Existing catalytic materials are insufficiently rugged. Next generation ignition catalysts must possess greater thermal stability.

Figure 1. Diagram of liquid monopropellant fueled thruster.

Eltron is addressing the development of a new catalyst and ignition technology for advanced monopropellants including:

- Mixtures of hydroxylammonium nitrate (HAN) or other such oxidizers and a combustible component
- High energy ionic liquid monopropellants

Eltron's new, proprietary catalyst meets the requirements for these systems:

- Catalyst possesses intrinsic activity for ignition
- Catalyst possesses the required thermal stability
- Catalyst has good erosion resistance
- Proprietary catalyst composition and enhanced surface area leads to minimal delay times

Our goal is development of a catalyst exhibiting reproducible ignition at low temperature, but also possessing the favorable attributes described above. Thus far, ***Eltron's catalyst has displayed comparable activity to alumina supported iridium at temperatures ≥150℃ and tolerates exposure to at least 1900℃ at significantly lower catalyst cost.***

Monopropellant ignition can be affected in a variety of ways. For example, pressure, lasers, and thermal ignition have all been explored. Thermal ignition is accelerated by the presence of a catalyst. Such a catalyst can be placed in a bed or a monolith (**Figure 1,** above) and the liquid fuel or its vapor directed over the catalyst, resulting in thermal decomposition, producing radicals and associated processes that lead to combustion.

Catalyst materials have been developed to the point of the design of catalyst forms (**Figure 2**). Improvements in composition and preparation, aimed at obtaining optimal performance and thermal stability are continuing. Eltron has also initiated testing of preferred catalysts in a laboratory scale device (**Figure 3**).

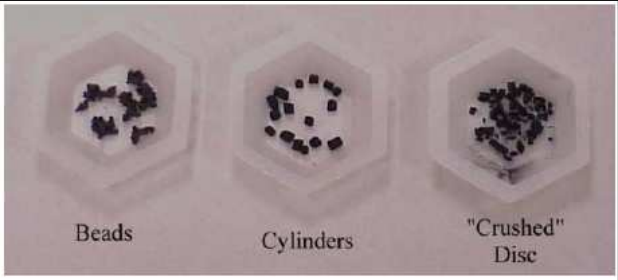

Figure 2. Catalyst pellet forms prepared.

The development effort will result in the availability of rugged catalysts for ignition of HAN/fuel mixtures and other advanced monopropellants. Such materials will find application in thrusters, as well as in other devices such as liquid gas generators, emergency power units (EPUs), auxiliary power units (APUs), and thrusters. Potential non-NASA applications include the above propulsion applications.

Another application will be in catalytic combustion as found in natural gas powered turbines and in environmental control technologies. Interested companies will include not only those involved in propulsion technologies, but also catalysis companies and waste management companies with interests in catalytic destruction of environmental pollutants.

Figure 3. Photograph of test run at Eltron with HAN/glycine and advanced ignition catalyst.

Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at business@eltronresearch.com.

To learn more about Eltron Research & Development and the other technologies that the company is researching and commercializing, visit www.eltronresearch.com.

Eltron Research & Development

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