Project Summary

Despite current progress in advanced, monopropellant technology based on energetic, ionic liquids (HAN, HEHN, TEAN and ADN), their application in small, chemical thruster propulsion requires a stable and reliable ignition source.

The STTR project demonstrated thermo-catalytic ignition and combustion of advanced mono-propellants in micro-channels. Cylindrical tubes on the order of a millimeter in diameter were fabricated for investigation. An innovative electroforming from molten salts technique, in combination with formation of catalytic iridium microcrystals, facilitated manufacturing of sub-millimeter diameter micro-tubes with enhanced internal surfaces area.

Plasma Processes partnered with the University of Connecticut. Professor Chih-Jen Sung led the university research team that investigated and measured the ignition and combustion of mono-propellant AF-M315E in microtubes.

The STTR Phase I results are as follows:

- Iridium microchannel tubes with catalytic surfaces were fabricated.
- Thermo-catalytic activity of iridium microtubes was investigated.
- Ignition and combustion of AF-M315E monopropellant was demonstrated.
    - Baseline tubes ignite AF-M315E at 900K
    - Enhanced surface area tubes ignite AF-M315E at 770K
    - Microchannels tested for up to 20 hours without degradation
- Development of microthruster is feasible
- Significant interest by Aerojet, Ampac, ATK, Northrop Grumman, Dynetics

In Phase II, a micro thruster will be developed and tested using an environmentally friendly monopropellant (AF-M315E).