NASA SBIR/STTR Technologies

X9.04-9517 - *Lightweight Nozzle Extension for Liquid Rocket Engines*

Contract No. NNX09CB41C
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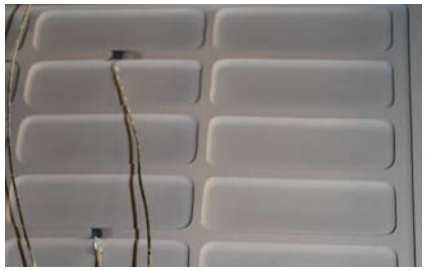
Identification and Significance of Innovation

The J-2X will provide NASA with a unique engine class for future space exploration missions. To manage thermal requirements, the metallic nozzle extension (NE) of the J-2X will require a high emissivity coating. During Phase II, Plasma Processes developed a highly emissive coating formulation that meets the operational requirements of the J-2X NE. The high emissivity and durability of the coating were demonstrated in relative environments at Marshall Space Flight Center (MSFC), Thermophysical Research Laboratory (TPRL) at Purdue University, and Plasma Processes.



Coated sub-scale NE pocket panel after testing at MSFC's Hot Gas Facility

Coating application on mock full-scale J-2X NE

Phase II Technical Objectives

Identify/develop highly emissive plasma sprayed coating suitable for metallic Haynes 230 J-2X NE. Optimize emissivity and durability of coating and evaluate in relevant environments. Demonstrate ability to apply coating to full-scale sized nozzle extension.

Phase II Work Plan

•Thrust I – Screen/develop high emissive coatings for J-2X NE

•Thrust II – Evaluate and optimize coating emissivity & performance

•Thrust III – Scale manufacturing process to accommodate full scale J-2X NE

NASA and Non-NASA Applications

•J-2X nozzle extension
•Ascent and descent engines
•Leading edges and control surfaces for hypersonic aircraft
•Propulsion components for space access and space return vehicles
•Nosetips, rocket nozzles & control vanes for strategic/tactical missiles
•Thermal control components for nuclear power applications
•Crucibles
•High power x-ray targets
•Furnaces and boilers

Firm Contacts

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NON-PROPRIETARY DATA