Paper ID: 39912
student

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (3) (10)

Author: Mr. Deepak Atyam
Purdue University, United States, datyam@gmail.com

CHARACTERIZATION OF SELECTIVE LASER MELTING IMPINGING INJECTORS

Abstract

Additive manufacturing has given flexibility to design and produce liquid rocket injectors that were not possible with traditional manufacturing techniques due to decreased design constraints, production time, and production cost. The most common metal additive manufacturing technique to produce high precision components, Direct Metal Laser Sintering (DMLS), has not been extensively characterized and is known to have disadvantages in surface roughness and overall printing accuracy when compared with traditional manufacturing methods. For those reasons DMLS impinging jet injectors have been studied and analyzed to understand variances in designed versus produced dimension, accuracy of produced components, and spray characteristics. Patternation was used to measure the spray structure at axial locations of 50mm and 75mm from the injector face in the Like-Doublet, Unlike Triplet, Like Quadlet, and Unlike Pentad configurations. Phase Doppler Anemometry (PDA) was used to characterize the resultant spray in terms of average droplet size (271.56, 269.66, 309.16 m), average droplet velocities (27.30, 28.17, 22 m/s), and $D_32's(488.46, 485.6, 559.85) in the Like-Doublet, Unlike Triplet, and, Like Quadlet configurations respectively.$