

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Advancements in Materials Applications and Rapid Prototyping (9)

Author: Mr. Robert Carter

NASA Glenn Research Center, United States, robert.w.carter@nasa.gov

Mrs. Susan Draper

United States, susan.l.draper@nasa.gov

Dr. Ivan Locci

United States, ivan.e.locci@nasa.gov

Mr. Bradley Lerch

NASA Glenn Research Center, United States, bradley.a.lerch@nasa.gov

Dr. David Ellis

United States, david.l.ellis@nasa.gov

Mr. Paul Senick

NASA Glenn Research Center, United States, paul.f.senick@nasa.gov

Mr. Michael Meyer

NASA Glenn Research Center, United States, michael.l.meyer@nasa.gov

Mr. James Free

National Aeronautics and Space Administration (NASA), United States, james.m.free@nasa.gov

Mr. ken Cooper

United States, kennith.g.cooper@nasa.gov

Mr. Zachary Jones

United States, Zachary.c.Jones@nasa.gov

MATERIALS CHARACTERIZATION OF ADDITIVELY MANUFACTURED COMPONENTS FOR  
ROCKET PROPULSION

**Abstract**

To advance Additive Manufacturing technologies for production of rocket propulsion components the NASA Glenn Research Center (GRC) is applying state of the art characterization techniques to interrogate microstructure and mechanical properties. The materials, components, and additive manufacturing processes being investigated are of unique interest for upper stage rocket engines. Materials include titanium, copper, and nickel alloys. Additive manufacturing processes include laser powder bed, electron beam powder bed, and electron beam wire fed processes. Various post build thermal treatments, including Hot Isostatic Pressure (HIP), have been studied to understand their influence on microstructure, mechanical properties, and build density. Micro-computed tomography, electron microscopy, and mechanical testing in relevant temperature environments has been performed to develop relationships between build quality, microstructure, and mechanical performance at temperature. A summary of GRC's Additive Manufacturing strategy and experimental findings will be presented.