COLLEGE OF ENGINEERING
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Research Horizons Day & Research Week April 6-13, 2018

Research Horizons Day

Dynamic Behavior of Materials

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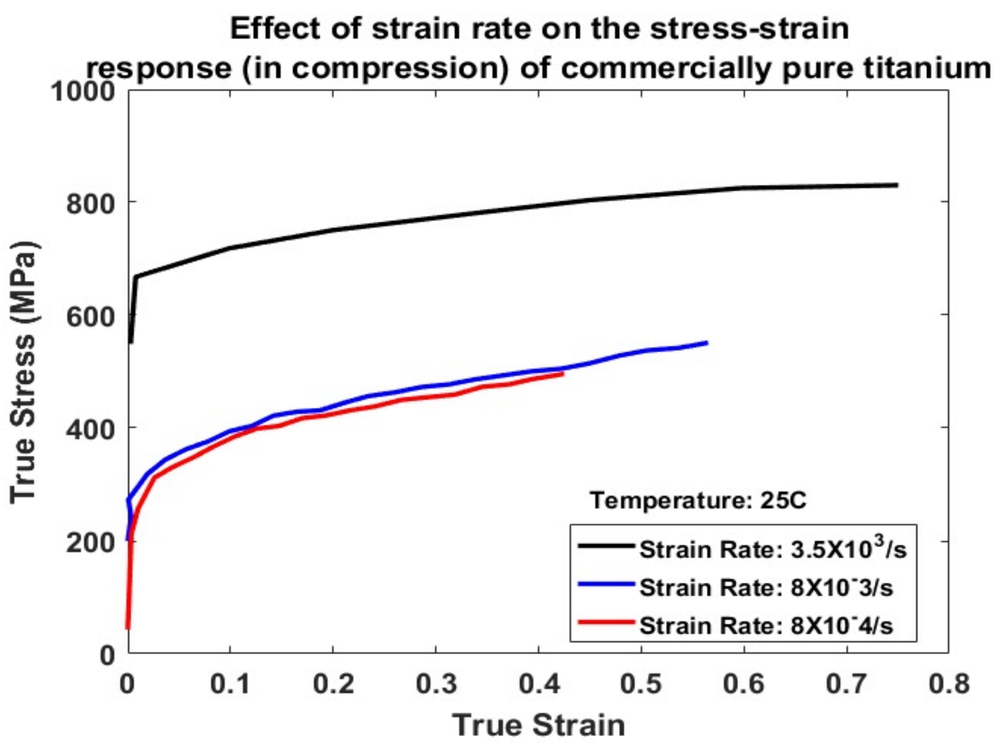
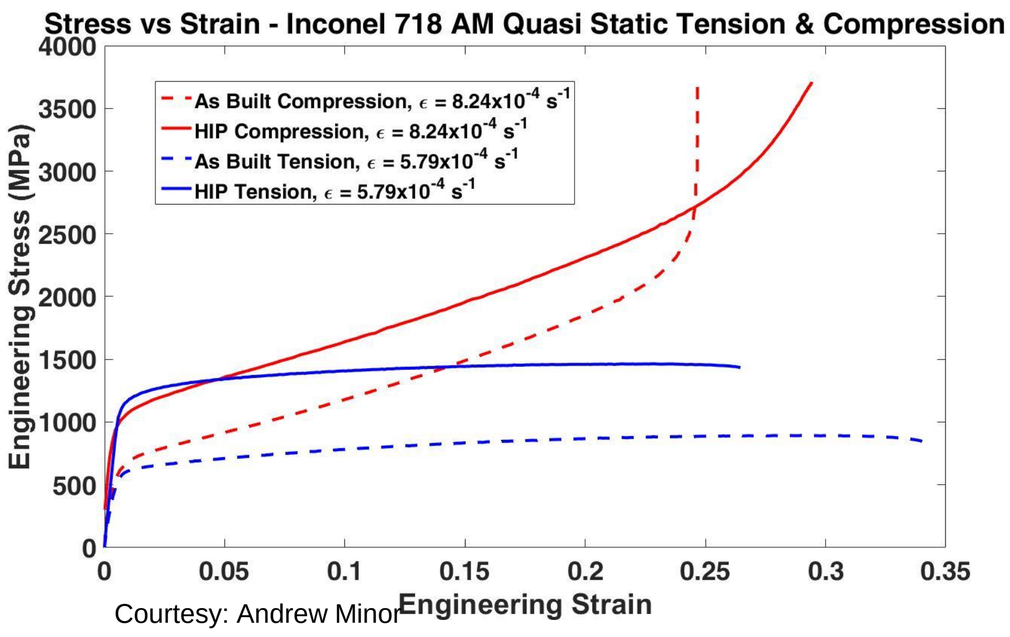
Overview

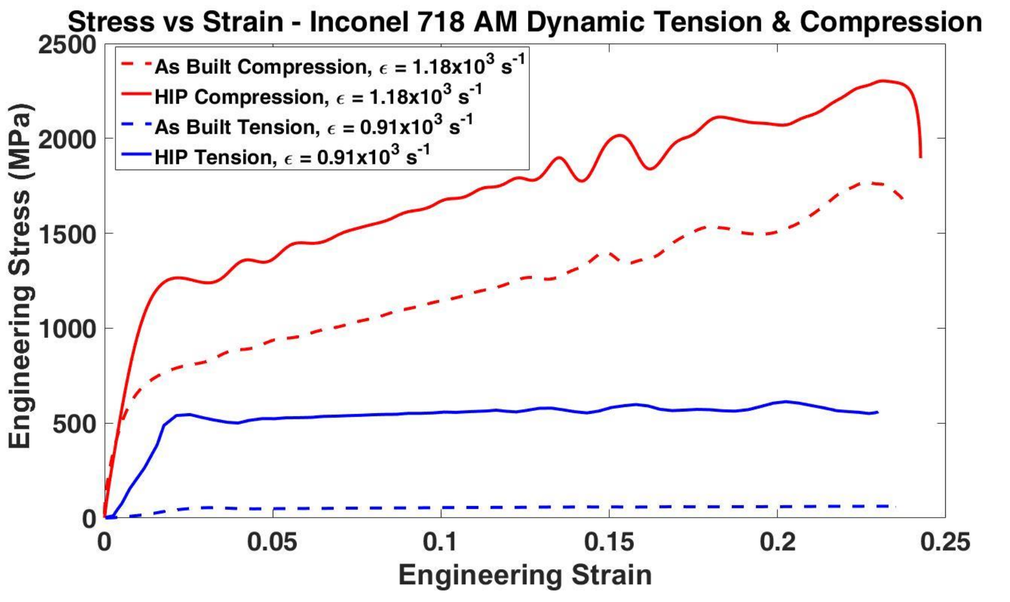
The dynamic behavior of novel materials can be quantified using a Split-Hopkinson Pressure Bar (SHPB). By subjecting materials to high strain rates, typically on the order of 100,000 to 1,000,000 times greater than conventional quasi-static testing, one is able to quantify mechanical stresses and strains in a material by collecting data from the SHPB tests through a combination of digital image correlation (DIC) and wave propagation analysis.



Courtesy: Meyers, Marc A. *Dynamic Behavior of Materials.* John Wiley & Sons, 1994.



Courtesy: Andrew Minor



Courtesy: Andrew Minor

Key Findings

This work investigates the effect of different heat treatments, i.e. Stress-Relieved and HIPed, on mechanical behavior of super allows. Our focus is on quantifying the effect of those heat treatment parameters on slow strain-rate deformation and high strain-rate deformation. It is seen that the microscopic defects, such as porosity, that are developed during the manufacturing process have greater impacts on mechanical behavior when materials are dynamically deformed.

Impact

This investigation, made it possible to identify and quantify the effect of different manufacturing variables, specifically heat treatment parameters, on mechanical response of novel, additively manufactured super alloys. The outcome of this research increases the readiness of replacing conventional materials with novel super alloys for armor applications.

Acknowledgements

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