MECHANICS OF MATERIALS AT EXTREME CONDITIONS: THE EFFECT OF STRAIN RATE AND MESO SCALE APPROACH

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ABSTRACT
Understanding the failure mechanisms of materials at extreme condition is essential and at the same time challenging. There have been different approaches proposed over the years to studying materials response at extremely aggressive environment, for example high pressure, ultrahigh temperature. With the advent of high speed imaging systems and computer processing power, one can study the failure mechanisms at such a high events by carefully analyzing the digital images taken during testing. We used a digital image based approach to understand the fundamental deformation and failure mechanism of materials at different loading conditions, at different time and length scale and at range of temperatures. In this talk, our recent work progress will be highlighted and different examples, such as the compaction wave propagation and multiscale failure mechanisms in PBX, shock loading of rigid foams, the effect of strain rate on grain level deformation of polycrystalline metals and graded cellular materials and high temperature deformation of metals, will be presented.

BIO
Dr. Addis Kidane is an Associate Professor of Mechanical Engineering at the University of South Carolina. He got his Ph.D. from the University of Rhode Island in 2009 and spent two years at California Institute of Technology as a postdoctoral scholar before he moves to Columbia. His research focuses on, multifunctional materials, materials behavior at extreme conditions, materials subjected to shock and blast loading and fracture and failure of materials at different length and time scale.

Dr. Kidane is a recipient of many prestigious awards including, (1) the 2018 J. W. Dally Young Investigator Award, from Society of Experiment Mechanics (2) the 2016 ORR Early Career Award from ASME Materials Division, (3) the 2014, AFOSR Young Investigator Award and (4) The 2013 Haythornthwaite Research Initiation Grants from ASME Applied Mechanics Division.

Dr. Kidane is active member in the Society for Experimental Mechanics, the American Society of composites, and the American Society for Mechanical Engineering.