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The effect of temperature and microstructure on dynamic yield behavior of fcc aluminum and bcc tantalum LAURA CHEN, Imperial College London, DAMIAN SWIFT, RYAN AUSTIN, JEFF FLORANDO, JAMES HAWRELIAK, AMY LAZICKI, MICHAEL SACULLA, Lawrence Livermore National Laboratory, DANIEL EAKINS, Imperial College London, JOEL BERNIER, MUKUL KUMAR, Lawrence Livermore National Laboratory — This talk will compare the dynamic strength of fcc aluminum and bcc tantalum at a range of temperatures under extreme loading conditions to investigate the influence of temperature on the early stages of yielding and plastic flow in materials of distinct crystal structure. Laser-driven shock experiments have been performed on aluminum and tantalum foils at initial temperatures extending from approximately 120 K - 800 K at strain rates reaching 10^7 s^{-1}. In the case of aluminum, time-resolved velocimetry measurements reveal an anomalous, marked increase in yield strength with initial temperature, whereas the yield strength of tantalum is seen to remain nearly constant over the same temperature range. These results are consistent with prior work at lower strain rates, and discussion will explore various deformation mechanisms and how they interact and compete to determine yield behavior.

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