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Laser-Induced Spall of Aluminum and Aluminum Alloys at High Strain Rates DOUGLAS DALTON, JONATHAN BREWER[1], AARON BERNSTEIN, WILL GRIGSBY, DESPINA MILATHIANAKI, EVAN JACKSON, University of Texas-Austin, RICHARD ADAMS, PATRICK RAMBO, JENS SCHWARZ, AARON EDENS, MATTHIAS GEISSEL, IAN SMITH, Sandia National Laboratory, ERIC TALEFF, TODD DITMIRE, University of Texas-Austin — We report on laser-induced spall experiments aimed at studying how a material's microstructure affects the tensile fracture characteristics at high strain rates ($>10^6$ s^{-1}). We used the Z-Beamlet Laser at Sandia National Laboratory to drive shocks and to measure the spall strength of aluminum targets with various microstructures. The targets were recrystallized, high-purity aluminum (Al-HP RX), recrystallized aluminum + 3 wt.% magnesium (Al-3Mg RX), and cold-worked aluminum + 3 wt.% magnesium (Al-3Mg CW). The Al-3Mg RX and Al-3Mg CW are used to explore the roles that solid-solution alloying and cold-work strengthening play in the spall process. Using a VISAR and sample recovery techniques, we are able to measure spall strength and failure morphology in these targets simultaneously. We find that the spall strength is highest for Al-HP RX. Analysis reveals that material grain size plays a vital role in the fracture morphology and spall strength results.

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