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Spall Threshold Stress for Al Alloys with Varying Microstructures X.L. CHEN, S.K. DWIVEDI, J.R. ASAY, Institute for Shock Physics, Washington State University, D.F. FIELD, School of Mechanical and Materials Engineering, Washington State University — A series of plate impact spall experiments was conducted on 6061 Al with three different grain sizes, ultra pure Al, and commercially pure (1060) Al samples for various thicknesses and impact stresses. The spall threshold stress, calculated from the pull back velocity, was determined for different initial microstructures, impact stresses, pulse durations, and loading rates. It is found that the spall threshold stress increases over the stress range of 4-13 GPa and then decreases for impact stress approaching 22 GPa. Results indicate that the threshold stress depends more on tensile loading rate than on the impact stress duration. Initial microstructure and impurities have a diminishing effect on the spall threshold stress as impact stress increases from 4-22 GPa. However, these properties have a pronounced effect on the structure of the pull back velocity profile at all stress levels. The change occurring in the profile slope is believed to signify either the transition from brittle to ductile fracture, or heterogeneous spallation resulting in secondary spall planes that are predicted by mesoscale simulations. Work supported by DOE.

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