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Laser Shock-Induced Spalling in Tantalum[1] TANE REMINGTON, University of California, San Diego, CHRISTOPHER WEHRENBERG, BRIAN MADDOX, DAMIEN SWIFT, BRUCE REMINGTON, Lawrence Livermore National Laboratory, MARC MEYERS, University of California, San Diego, UCSD COLLABORATION, LLNL COLLABORATION — The processes of dynamic failure by spalling were established in nano, poly, and mono crystalline tantalum in recovery experiments following laser compression and release. Samples were compressed over a range of energies varying from 50 to 120 J/mm^2 and initial duration of 3 ns. The waves were allowed to reflect at the back surface (specimen thickness: 250 um) and the process of separation was characterized by different techniques: optical microscopy, SEM, and microcomputerized tomography. Additionally, the pull back signal was measured by VISAR and the pressure decay compared with HYADES simulations. There are clear differences in the microscopic fracture mechanisms, dictated by the grain sizes. In the nano and polycrystals, spalling occurred by ductile fracture favoring grain boundaries. In the monocrystals, these are absent, and the process was of ductile failure by void initiation, growth and coalescence. The spall strengths in laser experiments are compared with those in experiments at much larger durations (us regime).

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