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Effect of Pre-Strain on the Twinning Behavior in Tantalum JEFFREY FLORANDO, NATHAN BARTON, BASSEM EL-DASHER, MUKUL KUMAR, Lawrence Livermore National Laboratory, CHANGQIANG CHEN, Northwestern University, KALIAT RAMESH, KEVIN HEMKER, Johns Hopkins University — In an effort to understand the relationship between the mobile dislocation density and twinning, polycrystalline Ta samples have been pre-strained to various amount of strain at room temperature, and then tested at liquid nitrogen temperatures at a stain rate of 1/s, and under laser-induced shock wave loading; conditions that promote twinning. Recovered samples were characterized using EBSD orientation mapping along with transmission electron microscopy to assess the occurrence of twinning under each test condition. The results show that as the dislocation density increases, there are discernible differences in the initial portion of the stress-strain and wave profile data which can be linked to the amount of twinning observed. In addition, the experimental observations have been compared with a crystal level twinning model. The implications of these findings on the deformation behavior will be discussed.

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