

Abstract Submitted
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Modeling of the elastic-plastic behavior of annealed tantalum under low amplitude ramp wave loading¹ JOW-LIAN DING, Washington State University, JAMES ASAY, Sandia National Laboratories — Ramp wave experiments were conducted to determine elastic-plastic response of annealed Ta to peak loading stresses of about 17 GPa. These results revealed a strong elastic overshoot, followed by substantial stress relaxation behind the elastic precursor. Similar effects are observed in shock loading. However, unlike shock loading, the peak of the elastic precursor exhibited very little decay with propagation distance. Several commonly used viscoplasticity type material models for high rate deformation were used to evaluate this effect, but were unable to describe the measured elastic overshoot and stress relaxation. However, a dislocation multiplication model used to describe the yield point phenomenon was able to capture the essential features of the experimental observations. The dislocation multiplication model is based on dislocation-dislocation self interactions and dislocation-solid matrix interactions. Work is in progress to refine the model for better quantitative agreement with the experimental data.

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