

Abstract Submitted  
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**Tantalum strength model incorporating temperature, strain rate and pressure** HOJUN LIM, CORBETT BATTAILE, JUSTIN BROWN, MATT LANE, Sandia National Laboratories — Tantalum is a body-centered-cubic (BCC) refractory metal that is widely used in many applications in high temperature, strain rate and pressure environments. In this work, we propose a physically-based strength model for tantalum that incorporates effects of temperature, strain rate and pressure. A constitutive model for single crystal tantalum is developed based on dislocation kink-pair theory, and calibrated to measurements on single crystal specimens. The model is then used to predict deformations of single- and polycrystalline tantalum. In addition, the proposed strength model is implemented into Sandia's ALEGRA solid dynamics code to predict plastic deformations of tantalum in engineering-scale applications at extreme conditions, e.g. Taylor impact tests and Z machine's high pressure ramp compression tests, and the results are compared with available experimental data. Sandia National Laboratories is a multi program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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