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Investigation of tantalum room temperature isothermal compression to multi-megabar pressures using two-stage diamond anvils KALEB C. BURRAGE, CHRISTOPHER S. PERREAULT, Dept. of Physics, University of Alabama at Birmingham, Birmingham, AL, ERIC MOSS, JEFFREY S. PIGOTT, BLAKE T. STURTEVANT, Shock and Detonation Physics, Los Alamos National Laboratory, Los Alamos, NM, JESSE SMITH, High Pressure Collaborative Access Team, X-ray Science Division, Argonne National Laboratory, Lemont, IL, YOGESH K. VOHRA, Dept. of Physics, University of Alabama at Birmingham, Birmingham, AL, NENAD VELISAVLJEVIC, Shock and Detonation Physics, Los Alamos National Laboratory, Los Alamos, NM — Ta has a bcc structure at room P-T and based on previous studies this structure has been proposed to be stable up to $P>100$ GPa and temperatures up to the melt. Extending P-V data to higher P and obtaining accurate isothermal data is vital for further development of SESAME-EOS tables and next generation modeling of EOS and strength of Ta and other metals. In this study, we performed multiple compression studies of Ta. We primarily employed the new two-stage toroidal diamond anvil concept to achieve $P \approx 270$ GPa ($V/V_0 = 0.60$) using rhenium as a pressure standard, while performing *in situ* micro x-ray diffraction measurements at the High Pressure Collaborative Access Team (HPCAT) facility at APS. Concurrently, we have performed multiple hydrostatic and non-hydrostatic measurements of Ta using traditional single-stage anvils. Comparing data collected under both conditions provides better insight into the effects of non-hydrostatic stress distribution on behavior of Ta.

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