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New Phase Diagram of Ta: Bridging Laser Heated Diamond-Anvil Cell and Shock Melting[1] CHRISTINE J. WU, PER A. SÖDERLIND, JAMES N. GLOSLI, JOHN E. KLEPEIS, Lawrence Livermore National Laboratory — Determination of the melt line of materials under high pressures is essential for establishing its phase diagrams and has important implications for geophysics, material science, and high-pressure physics. So far, melting temperatures at high pressure are primarily measured by *in situ* laser-heated diamond-anvil cell (DAC) or shock wave experiments. Often, these two methods yield significantly different results, particularly for non close-packed metals, such as bcc metals. For instance, anomalously flat melting slopes were reported for numerous bcc metals by laser-heated DAC. The flatness of the melting slope is in sharp contrast to the classical Lindemann behavior which shock-melting temperatures follow closely. In this presentation, we will report a novel phase diagram of Ta obtained from *ab initio* methods, and molecular dynamics (MD) simulations, which resolves the long-standing controversy, and has significant impact on our understanding of phase diagrams of bcc metals.

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Christine J. Wu
Lawrence Livermore National Laboratory

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