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First The motion and mobility of screw and edge dislocation in bcc tantalum[1] ROBERT RUDD, KYLE CASPERSEN, CHRISTINE WU, MEI-JIE TANG, Lawrence Livermore National Laboratory — Strength in bcc metals is, surprisingly, not well understood; it is thought to be dominated at low temperature by the motion of 1/2<111> screw dislocations. The motion of these screw dislocations is thought to be controlled by nucleation and propagation of kinks along the dislocation line, which can at high stress result in the formation of debris (vacancies, interstitials, loops, etc) in the dislocation wake. We studied the motion of screw and edge dislocations in bcc tantalum by performing large-scale molecular-dynamics simulations using both Finnis-Sinclair potentials, and model-generalized-pseudopotential-theory (MGPT) potentials [1]. We present here simulation predictions for dislocation motion, mobility, and debris formation with respect to pressure, temperature, and strain rate. [1] J. A. Moriarty, Phys. Rev. B 42, 1609 (1990).; J. A. Moriarty, Phys. Rev. B 49, 12431 (1994).

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