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Metallurgical Effects Upon the Shock Response of Tantalum: Cold Work and Dilute Alloying JEREMY MILLETT, AWE — The response of the body centred cubic metal tantalum to shock loading has been studied for several decades, due to its use by the military in explosively formed projectiles. It can also be considered as an ideal body centred cubic metal, thus rendering it ideal for studies of fundamental mechanical and microstructural behaviour. Previous studies on well controlled, annealed specimens has shown that deformation is controlled by the motion of rather than the generation of a/2<111>{110} screw dislocations in straight segments, which result in little if any post shock hardening. In situ-shear strength measurements have also shown a significant strength reduction behind the shock front, suggesting that the motion of these dislocations acts as a stress relief mechanism. Similar effects have also been noted in tungsten and its alloys, but very recently, measurements in niobium and molybdenum show shear strength to be near constant behind the shock front. Other factors, such as variation of Peierls stress effecting ease of dislocation generation and the propensity to twin also have a strong effect upon the shock response. In this presentation, we return to tantalum, investigating the differences in shock response between a low dislocation density (annealed) and high dislocation density (cold rolled) material. We also examine the effects of dilute alloying through the addition of 2.5wt% tungsten to tantalum. Results are discussed in terms of the shear strength and its variation with time behind the shock front.

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