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The Influence of Interstitial Oxygen on the Alpha to Omega Phase Transition in Titanium and Zirconium ELLEN CERRETA, GEORGE GRAY, ANGUS LAWSON, CHUCK MORRIS, ROBERT HIXSON, PAULO RIGG, Los Alamos National Laboratory, MST-8 TEAM, DX-2 TEAM — The pressure for the α to ω phase transition was investigated for two grades of titanium and three grades of zirconium. A series of shock experiments were conducted from 5 to 35GPa and revealed that the pressure for the phase transition increases with increasing interstitial oxygen content and is completely suppressed in low purity materials. For the high purity Ti and Zr in this study, the pressure for the phase transition occurred at 10.4 and 7.1GPa, respectively and no reverse transformation was observed upon unloading. Increasing the oxygen content increases the number of octahedral sites occupied; this is postulated to increase the pressure for the phase transition. Neutron diffraction and TEM were utilized to quantify the volume fraction of metastable ω phase and to characterize the microstructures within the high purity, shocked, and "soft" recovered specimens. Quasi-static reload experiments examined the effect of the shocked-induced substructure on post-shock mechanical properties. The reload response of materials shock prestrained above the α to ω phase transition displays enhanced hardening, while specimens shocked below the transition pressure do not when compared to their quasi-static constitutive behavior.

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