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Phase Transformation of Nitinol Shape Memory Alloy under Dynamic Uniaxial Strain Compression[1] JIALONG NING, JOW-LIAN DING, Y.M. GUPTA, Washington State University — The stress-induced martensitic transformation of Nitinol, a near equi-atomic NiTi based shape memory alloy (SMA), has been studied extensively, but primarily under uniaxial stress loading. The transformation stress under such loading is quite low (0.5-0.8 GPa), and appears to depend on the loading rate. In this study, various types of plate impact experiments over the loading rate range of 10^5-$10^7 s^{-1}$ were designed and conducted to a peak stress of 6 GPa to capture the phase transition of Nitinol under dynamic uniaxial strain loading. Particle velocity profiles and wave velocities were measured using laser interferometry under shock and ramp compression. Additionally, sound speed measurements were made at various peak stresses. All of these experiments indicate that under dynamic uniaxial strain loading, the martensitic transformation of Nitinol occurs at $\sim$ 2 GPa. Further research is ongoing to gain insights on the role of stress states and loading rates on the stress-induced transformation of Nitinol, and to develop an understanding of the transformation behavior under different loading conditions.

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