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Deformation Twinning in Shock Compressed Magnesium Alloys CYRIL WILLIAMS, JONATHAN LIGDA, US Army Research Laboratory — Extension $\{10-12\}$ and contraction $\{10-11\}$ twins, each with six twinning variants are the most prevalent deformation twins observed in magnesium and magnesium alloys. Twinning plays an important role on the plastic deformation of magnesium and magnesium alloys because they increase the deformation modes available during straining. Therefore, deformation twinning, texture changes, and second phase intermetallic particles were studied under shock compression using AZ31B and AMX602 magnesium alloys, which were mechanically processed via Equal Channel Angular Extrusion (ECAE) and Spinning Water Atomization Process (SWAP) respectively. Results show that twinning, texture changes, and second phase intermetallic particles can strongly influence the mechanical response and consequent failure of these materials. Spall failure in the ECAE processed AZ31B-4E magnesium alloy was dominated by debonding of the matrix magnesium from large Al-Mn-rich intermetallic inclusions after the passage of shock stresses ranging from 1.5 - 4.5 GPa. Whilst failure in the SWAP AMX602 magnesium alloy for the same shock stress range reveals numerous isolated cracks around the spall plane. The spall surfaces of the AMX602 samples were striated possibly due to corrosion of the SWAP powder prior to green-compaction. Mixed-mode failure was observed in both materials possibly due to homogeneous and heterogeneous nucleation, growth, and coalescence of nanovoids and microvoids respectively.

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