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Dynamic response of ECAE-AZ31 magnesium under pressure shear

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ABSTRACT

Lightweight and energy mitigation are considered the core characteristics required of any material system subjected to impact loading conditions, and magnesium alloys represent potential materials for such systems. ECAE-AZ31, an Mg alloy system processed through Equal Channel Angular Extrusion (ECAE), is a particularly interesting candidate given its specific strength. We seek here to develop an understanding of its constitutive response at very high rates of loading. We perform an experimental investigation of the behavior of this material, at strain rates on the order of 10^5 s^{-1} , using the high-strain-rate pressure-shear plate impact technique. We also present a brief description of the experimental setup and describe the diagnostic techniques used. Using the measured behavior and examination of the initial and deformed microstructures, we examine the influence of anisotropy and micromechanisms (twinning, dislocations) on the overall constitutive response. The goal is to parameterize such influences to incorporate them into a constitutive framework.