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STRAIN-RATE DEPENDENT CHARACTERIZATION OF ARMOX 500T FOR GISSMO PARAMETERIZATION USING 3D DIGITAL IMAGE CORRELATION

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ABSTRACT

Generally, ARMOX 500T has been modeled using an extended 2D Johnson and cook fracture criteria with triaxiality dependence. More recent work has involved the effect of lode angle parameter on the fracture strain to calibrate a more sophisticated fracture locus. However, there has been no characterization of ARMOX 500T using the Generalized Incremental Stress State Dependent Continuum Damage Model (GISSMO). This is a strain-based phenomenological continuum fracture model which uses empirical data from mechanical tests covering a wide range of stress states, to map out the fracture and instability strains of the material as a function of its stress state. GISSMO has been chosen for its capacity to predict non-proportional loading and mesh dependent post-critical deformation. Using triaxiality and lode angle parameter as stress state variables, 18 specimens are designed for quasistatic characterization to cover a wide range of stress states. The stress states differentiate the effects of triaxiality and lode angle on the fracture strain, ranging from uniaxial compression, flat and round tension, tensile plane strain, in-plane shear, shear- tension, and biaxial tension. High strain rate compression and shear tests will be conducted on the direct impact Hopkinson bar (DIHB) using cylindrical, cubic, and flat top-hat plane strain shear specimens to account for viscous drag effects on plasticity. This research will focus on delivering the experimental instability and fracture strains in the quasistatic and dynamic range as a function of strain rate and stress state using a combination of the universal testing machine, Hopkinson bars, and non-contact measurement techniques including ultra-high-speed 3D digital image correlation (DIC). The subsequently developed material model is intended to be used in LS-DYNA using the GISSMO for ballistic impact applications.