IDOXURIDINE CALIBRATION WITH GEOS-MPM*

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Abstract.
Material parameters such as Young's modulus, Poisson's ratio, tensile strength, and compressive strength for niche materials are often inadequately documented or unknown. Even when efforts are made to determine these parameters, the results can be unreliable or prone to error due to challenges in testing, preparation, material supply, and intrinsic properties such as anisotropy. For instance, high-explosives present significant safety and handling challenges, making direct experimentation difficult. Consequently, inert surrogate materials, known as mock high-explosives or "mocks," are often used as substitutes. These mocks are designed to closely replicate the thermomechanical response of actual high-explosives and, like their energetic counterparts, are typically brittle. Brittle and quasi-brittle materials are known to degrade primarily through the formation and growth of micro-cracks, the development of macro-scale cracks, and the eventual coalescence of these cracks, leading to fracture and fragmentation. This work showcases the calibration and uncertainty quantification of the inert crystal within a mock, specifically idoxuridine. The approach utilizes a combination of micro-CT imaging, a limited set of experimental mini-uniaxial quasi-static compression tests, and a series of explicit material point method simulations. Each material point simulation incorporates statistically variable size-dependent strength scaling for realistic brittle failure, gradient-field partitioning for frictional self-contact and separation, and a ceramic damage material model for accuracy and robustness in material characterization.

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