Quantitative Relationships between Stress Distributions, Microstructure and High Strain Rate Performance Of Advanced Ceramics: A Preliminary Report

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ABSTRACT:

Ceramics have become useful and productive in engineering applications, often replacing metal parts while providing improvements to the system. However, the relationship between characteristics of ceramic materials and measured properties is still being explored by the scientific community. This study focuses on ceramics under high compressive stress, high pressure, large strain, and high strain rate, particularly the effects of microstructure and the implications of irregular stress distributions. Preliminary studies on microstructure and stress conditions in ceramics are presented.

Much mathematical and engineering literature has been devoted to the influence of microstructure in metals. One aim of this study is to clarify the mathematical dependencies of microstructure such as preferred grain orientation, misorientation, and grain geometry in constitutive equations governing the behavior of ceramics. In addition, inspired by literature showing unexpected stress distributions in simulations of ceramics under high strain rate conditions, relationships between the distribution of stress in a ceramic material and the material's behavior are explored.

KEYWORDS: advanced ceramics, microstructure, stress distribution

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