Abstract Submitted
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Nanosecond to Picosecond Instability Regimes for Solids Under Large Deformation R.A. GRAHAM, The Tome Group — Modeling of physical, chemical, and mechanical behaviors of solids under large finite deformation requires identification and measurement of often ambiguous, interacting behaviors. For times less than a few nanoseconds mechanical processes are not constrained by macroscopic conditions of uniaxial strain. Rather, behaviors are consequences of inertial responses controlled by crystallography, chemistry and morphology. At every moment - at each particular place - responses are born anew. Response may be inferred from related measurements as typically assumed. Nevertheless when combined with other excitations or unknown instabilities, originally unresolved events may be significant or dominate. Notable are: large magnetic fields, large electric fields, structured loading, instrumentation with piezoelectric crystals or optical windows, ferroelectric crystals or ceramics, polymers; as well as ballotechnic reactions. Instabilities resulting from mass, thermal, thermochemical, or chemical accelerations (either, or, and) may readily lead to observable effects in interactive environments. Such instabilities are not quantitatively predictable today. Forward-looking modeling requires data from sub-nanosecond, three-dimensional acceleration measurements rather than engineering fixes. Interactions among mechanical, electronic, and optical processes are overt in the original piezoelectric 3-Zone Model of Neilson and Benedick [1], and recent and related work on finite-strain deformation science.

[1] F. W. Neilson, W. B. Benedick, W. P. Brooks, R. A. Graham, and G. W. Anderson, in Les Ondes de Detonation, Centr. Recher. Scientific, Paris, France, pp. 391-419, 1962.

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