

Abstract Submitted
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Criticality of damage-failure transitions under dynamic and shock wave loading¹ OLEG NAIMARK, Institute of Continuous Media Mechanics RAS — Specific type of criticality in defect ensembles – structural-scaling transition related to damage-failure scenarios under dynamic and shock wave loading was established. It allowed development of phenomenology of damage-failure transition induced by defects collective modes, supported by experiments and high resolution “in-situ” study of dynamic crack propagation and spall failure in PMMA and vanadium, dynamic fragmentation statistics in glass and ceramics. Structural (SWFM and AFM) study in terms of scaling invariance established the linkage of evolution of these modes with material responses in large range of load intensity and interpretation of the links of dynamic crack branching and specific morphology of numerous spall failure in PMMA, multiscale invariance in defect ensembles as spall failure precursor in shocked vanadium, 1/f flicker noise statistics of fragmentation according to the temporal analysis of fracture luminescence data in fused glass and zirconium dioxide shocked bars. Simulation of mentioned experiments supported the features of universality related to the self-similar solution of collective modes of defects in the course of structural-scaling transition.

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