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**Structural-Scaling Transitions in Microshear Ensembles and Self-Similarity of Wave Fronts and Failure in Shocked Materials** OLEG NAIMARK, Institute of Continuous Media Mechanics of RAS — Statistical theory of mesodefects allowed establishment of new type of critical phenomena–structural-scaling transitions, to develop thermodynamics and phenomenology in terms of defect density tensor and structural scaling parameter, which reflects scaling transition and generation of collective modes of defects: shear transformation zones (STZ) and damage transformation zone (DTZ), which provide plastic relaxation and damage-failure transition. Shock wave experiments and structural study supported linkage of these modes with material responses in large range of load intensity and allowed interpretation: (i) mechanisms of failure wave generation and propagation that has the nature of delayed failure needed for excitation time of blow-up collective modes. Experimental study of failure wave generation and propagation was analyzed for Taylor test in fused quartz rod using high-speed framing and supported "delayed" mechanism of failure wave generation; (ii) self-similarity of wave fronts under reloading and unloading, fourth power universality of steady-state plastic was confirmed both theoretically and experimentally in plate impact test for copper and using NEW VIEW scaling analysis of STZ distribution in recovered specimen; (ii) transition from thermo-activation kinetics of plastic relaxation to steady-state relaxation and overdriven shock regime.

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