Abstract Submitted
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Defect induced structural-scaling transitions and shock waves evolution in large range of strain rates (experimental and theoretical study)[1] OLEG NAIMARK, YURI BAYANDIN, ICMM RAS, MARVIN ZOCHER, DEAN PRESTON, LANL, ICMM RAS TEAM, LANL TEAM — Statistically based phenomenology allowed formulation of thermodynamic potential and constitutive equations to establish link of defect induced structural-scaling transition, plastic flow and damage-failure transition. Relaxation properties of metals in strain rate range 10^3 $10^{10}\mathrm{s}^{-1}$ were analyzed that allowed interpretation: (i) self-similarity of shock wave profile for different stress amplitudes, mechanism of generation of second "elastic precursor" under reloading tests; (ii) mechanism of transition from thermally activated dislocation glide to regime of steady-state plastic wave and overdriven shock. Comparison of MTS-PTW and statistically based models allowed link hardening law, saturation stress and yield stress in thermal activation regime with non-linearity of thermodynamic potential, to propose interpretation of "singularity gap" between thermally activated dislocation glide and overdriven-shock regimes. Using 3D New View profilometry data correspondence of defect induced relaxation properties and multiscale correlation in defects ensemble was established for vanadium recovered specimens subject to quasi-static, dynamic and plate impact tests.

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