Abstract Submitted
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Fracture Energy Issues of Brittle, Microcrack Brittle, and Dislocation Ductile Materials[1] RAY B. STOUT, RhoBetaSigma Aff, 954 Venus Way, Livermore CA 94550-6346, RHOBETASIGMA AFF COLLABORATION — Somigliana elasticity models(1915) for dislocation-microcrack defect discontinuities in a material form an analog basis to relate dislocation density evolution to microcrack density evolution near an existing idealized crack-tip. Thus, a recent idealized field solution derived for stochastic dislocation density evolution near a crack-tip in a ductile material is also an analog applicable field solution for stochastic microcrack density evolution in a brittle material near a crack-tip. A non-equilibrium thermodynamic functional is derived and integrated to evaluate rates of dislocation and microcrack internal energy evolution due to the singularity terms of these crack-tip solutions in an arbitrary spatial crack-tip neighborhood and during an arbitrary fracture toughness load-up time interval of [0, t*]. At some time greater than t*, the available inter-atomic lattice(analog recoverable elastic) internal energy at a crack-tip becomes probabilistically sufficient, in an energy transfer-stability sense of Gibbs[1906], Griffith[1920], and Eshelby[Phil Trans Roy Soc, 1951], to be configurationally transported from locally recoverable internal energy at a crack-tip to non-recoverable crack-tip surface energy as a crack-tip propagates.

[1]N/A

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