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Thermal and mechanical dissipation associated with ramp and shock wave loading[1] JOW-LIAN DING, Washington State University — The entropy production mechanisms that cause the deformation process to deviate from isentrope response during ramp loading can be separated into mechanical and thermal dissipation processes. The former is due to inelasticity and rate effects inherent in deformation processes and the latter is due to irreversible heat conduction. Numerical simulations were used to gain insight into the relative importance of these two processes for ramp and shock loading. It is shown that material response for these loading conditions is essentially a manifestation of the interaction between the time scale associated with the loading process and the intrinsic time scales associated with mechanical deformation and heat transfer. The maximum ramp rate necessary to obtain quasi-isentropic compression depends on the intrinsic time scale of dissipation. Heat conduction was found to have a significant effect on the temperature history between two equilibrium states, but it contributes little to overall temperature change. However, the irreversible part of heat conduction is important to the net entropy change.

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