Meeting: 1001, Evanston, Illinois, SS 6A, Special Session on Nonlinear Partial Differential Equations and Applications

1001-35-224 **Corrado Lattanzio** (corrado@univaq.it), Dipartimento di Matematica Pura ed Applicata, Universita degli Studi di L'Aquila, L'Aquila, Italy, and **Athanasios E. Tzavaras***, Department of Mathematics, University of Wisconsin, Madison, WI 53706. *Structural properties of viscoelasticity and convergence to polyconvex elastodynamics.*

We consider a model of stress relaxation approximating the equations of elastodynamics. Necessary and sufficient conditions are derived for the model to be equipped with a global free energy and to have positive entropy production, and the resulting class allows for both convex and non-convex equilibrium potentials. For convex equilibrium potentials, we prove a strong dissipation estimate and two relative energy estimates: for the relative entropy of the relaxation process and for the modulated relative energy. Both give convergence results to smooth solutions. For polyconvex equilibrium potentials, an augmenting of the system of polyconvex elastodynamics and the null-Lagrangian structure suggest an appropriate notion of relative energy. We prove convergence of viscosity approximations to polyconvex elastodynamics in the regime the limit solution remains smooth. A modulated relative energy is also obtained for the polyconvex case which shows stability of relaxation approximations. (Received August 27, 2004)