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**Nonlinear hydrodynamic description of non-Newtonian fluids**
HARALD PLEINER, MPI Polymer Research, Mainz, MARIO LIU, Theor. Physics, Univ. Tuebingen, HELMUT R. BRAND, Theorie III, Univ. Bayreuth — We review conventional constitutive equations for non-Newtonian fluids from a hydrodynamic point of view. Using general thermodynamic and symmetry arguments and applying valid physical principles we describe viscoelasticity by setting up nonlinear dynamic equations either for a relaxing (Eulerian) strain tensor or for a transient orientational order parameter tensor. This covers the usual non-Newtonian effects, like shear thinning, strain hardening, stress overshoot, normal stress differences and non exponential stress relaxation. In both cases an effective dynamic equation for the stress tensor can be derived approximately and compared with conventional non-Newtonian rheological models. It is more general in structure than those, comprises most, restricts some, and discards a few of them.

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