

A Variational Approach to Strain-limiting Viscoelasticity

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Many materials we come across in our daily lives show viscoelastic response, such as aluminium, polymers and human tissue. One particularly interesting viscoelastic response is the strain-limiting one, which has been experimentally observed in a wide class of materials such as titanium alloys and biological fibres such as collagen (see [4] and references therein). This kind of material response has been modelled successfully using the recently developed implicit constitutive theory (see e.g. [1, 2, 3]). Among other advantages, it leads to a different small strain theory allowing for a nonlinear relationship between the linearized strain and the stress.

In this talk, I will give an introduction to modelling of viscoelastic material response in the context of implicit constitutive theory, and introduce a variational framework where existence of solutions is obtained for specific types of materials with particular choices of the nonlinear relationship between the stress and the linearized strain. The method of time-discretization is used so that classical results from the calculus of variations are applicable by considering Euler-Lagrange equations of certain functionals.

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