# On a 1-D model of stress relaxation in a solidifying glass

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Recently, the mini-glass works appeared on the market. When using this device, the crucial problem is to prescribe a cooling regime. The main technological objective is to prevent a crystalisation. So far, the potentional user was given just a vague advice and had to rely on a trial/error experience. The first step towards to more advacanced regulation system is a mathematical model of the device. The model should yield stresses and displacements at each position and time when a cooling regime is defined.

1-D model of a slab of glass of a small thickness is assumed. The governing equations are the classical 1-D linear viscoelasticity. In the weak formulation, we seak for $u(t) \in \mathcal{V}$ such that

$$a(u(t), v) + \int_0^t \psi(t, s)\, a(u(s), v)\, ds = (f(t), v) \qquad \forall v \in \mathcal{V}, \quad t \in (0, T)\,.$$

Here, $\mathcal{V}$ is a Banach space (essentialy $H_0^1$), $a(\cdot\,,\,\cdot)$ is the energy functional (linear elasticity is considered), the kernel $\psi(t, s)$ models (a sort of) synchronous material with a fading memory. The righthand side $f(t)$ represents the load due to the temperature gradients and also due to a *structural strain*, which models a relaxation towards the thermodynamical stability.

Details concerning definition of $f(t)$ will be given. A numerical solution of the governing equations will be proposed. It will be shown that the introduction of *structural strain* is crucial for the success of the model. Numerical results will be presented and commented.