# Homogenization of Visco-Elastic and Plastic Processes

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**Abstract.** This talk deals with processes in nonlinear inelastic materials whose constitutive behaviour is represented by the inclusion

$$\frac{\partial}{\partial t}[\varepsilon - B(x):\sigma] \in \partial\varphi(\sigma, x);$$

here by $\sigma$ we denote the stress tensor, by $\varepsilon$ the linearized strain tensor, by $B(x)$ the compliance tensor, and by $\partial\varphi(\cdot, x)$ the subdifferential of a convex function $\varphi(\cdot, x)$. This relation accounts for elasto-visco-plasticity, including a nonlinear version of the classical Maxwell model of visco-elasticity and the Prandtl-Reuss model of elasto-plasticity.

The constitutive law is coupled with the equation of continuum dynamics, and well-posedness is proved for an initial- and boundary-value problem. The function $\varphi$ and the tensor $B$ are then assumed to oscillate periodically with respect to $x$, and as this period vanishes a two-scale model of the asymptoptic behaviour is derived via Nguetseng's notion of *two-scale convergence.*

A fully homogenized single-scale model is also retrieved, and its equivalence with the two-scale problem is proved. This formulation is nonlocal in time, and is at variance with that based on so-called *analogical models,* that rest on an (apparently unjustified) mean-field-type hypothesis.