

Introduction to materials modelling

13. exercise - viskoplastic model

1. Investigate the behaviour of Perzyna type viskoplastic overstress model in a constant strain rate tensile experiment. Viscoplastic strain rate is defined as

$$\dot{\boldsymbol{\varepsilon}}_{vp} = \frac{1}{t_{vp}} \left\langle \frac{\sigma_{\text{eff}} - \sigma_{y0}}{\sigma_{y0}} \right\rangle^p \frac{\partial \sigma_{\text{eff}}}{\partial \boldsymbol{\sigma}},$$

where $\sigma_{\text{eff}} = \sqrt{3J_2}$ and

$$\boldsymbol{\sigma} = \mathbf{C}^e(\boldsymbol{\varepsilon} - \boldsymbol{\varepsilon}_{vp}).$$

- (a) Investigate the effect of strain rate.
- (b) Investigate how the value of the power $p \in [1, 6]$ influences to the behaviour at certain specific strain rate.
- (c) Investigate also the effect of the time parameter (viscosity parameter).

Draw the results in $(\varepsilon/\varepsilon_{y0}, \sigma/\sigma_{y0})$ -coordinates.