

## Foundations of Elastoplasticity: Subloading Surface Model

This book is the standard text book for elastoplasticity/viscoplasticity which is explained comprehensively covering the rate-independent to -dependent finite deformations of metals, soils, polymers, crystal plasticity, etc. and the friction phenomenon. Concise explanations on vector-tensor analysis and continuum mechanics are provided first, covering the underlying physical concepts, e.g. *various time-derivatives, pull-back and push-forward operations, work-conjugacy and multiplicative decomposition of deformation gradient tensor*. Then, the rigorous elastoplastic/viscoplastic model, called the *subloading surface model*, is explained comprehensively, which is based on the *subloading surface concept* to describe the continuous development of the plastic/viscoplastic strain rate as the stress approaches to the yield surface, while it can never be described by the other plasticity models, e.g. the Chaboche-Ohno and the Dafalias-Yoshida models assuming the purely-elastic domain. The main features of the subloading surface model are as follows:

1) The *subloading surface* concept underling the cyclic plasticity is introduced, which insists that the plastic deformation develops as the stress approaches the yield surface. Thus, the *smooth elastic-plastic transition* leading to the continuous variation of the tangent stiffness modulus is described always.

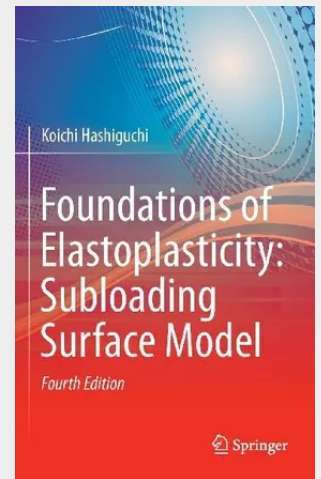
2) The *subloading - overstress model* is formulated by which the elastoplastic deformation during the quasi-static loading and the viscoplastic deformation during the dynamic and impact loading can be described by the unified equation. Then, only this model can be used to describe the deformation in the general rate of deformation, disusing the elastoplastic constitutive equation.

3) The *hyperelastic-based (visco)plasticity* based on the *multiplicative decomposition of deformation gradient tensor* and the subloading surface model is formulated for the exact descriptions of the finite elastic and (visco)plastic deformations.

4) The *subloading - friction model* is formulated for the exact description of the dry and the fluid (lubricated) frictions at the general rate of sliding from the static to the impact sliding.

Thus, all the elastic and inelastic deformation/sliding phenomena of solids can be described accurately in the unified equation by the subloading-overstress model. The subloading surface model will be engraved as the *governing law of irreversible deformation of solids* in the history of solid mechanics.

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