Multiscale analyis applied to material modeling

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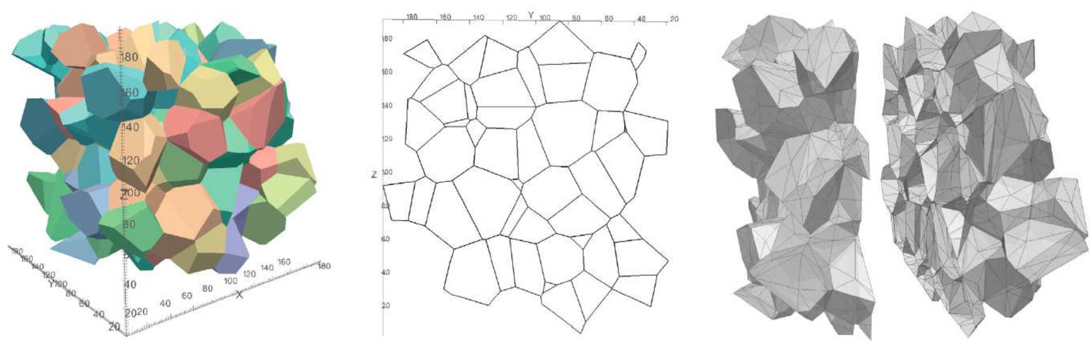
ABSTRACT

The presentation is aimed to cover areas related to modelling of material behaviour using different numerical schemes. Special emphasis is laid on homogenization procedures that include inelastic microstructural deformations. In detail the inelastic responses of polycrystals is investigated including induced anisotropy and nonlinear hardening. The necessary numerical procedures will be discussed and examples from different areas are introduced. A typical microstructure of a polycrystal and its discretization can be seen in the Figure below. Included in this presentation is the design of macroscopic constitutive equations with only few parameters that are obtained from homogenization of polycrystaline assemblies. The results are validated by means of experiments. The latter include as well results from microstructural observation as from classical pull-out-tests. Typical and important industrial applications range from cermic to ductile materials.



(a) Polycrystal consisting of VORONOI cell grains

(b) Cut through polcrystalline structure

(c) Three-dimensional view into the cutted polycrystal