Micromechanical modelling of nanocrystalline and ultrafine grained metals: A short overview - DTU Orbit (07/10/2019)

Micromechanical modelling of nanocrystalline and ultrafine grained metals: A short overview
An overview of micromechanical models of strength and deformation behaviour of nanostructured and ultrafine grained metallic materials is presented. Composite models of nanomaterials, polycrystal plasticity based models, grain boundary sliding, the effect of non-equilibrium grain boundaries and nanoscale properties are discussed and compared. The examples of incorporation of peculiar nanocrystalline effects (like large content of amorphous or semi-amorphous grain boundary phase, partial dislocation GB emission/glide/GB absorption based deformation mechanism, diffusion deformation, etc.) into the continuum mechanical approach are given. The possibilities of using micromechanical models to explore the ways of the improving the properties of nanocrystalline materials by modifying their structures (e.g., dispersion strengthening, creating non-equilibrium grain boundaries, varying the grain size distributions and gradients) are discussed.

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