

Quasi Rate-Independent Viscoplastic fcc-Polycrystals

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Geometry and kinematics of intragranular as well as intergranular plastic deformation of polycrystals are discussed. Elastic strain is covered by the effective medium homogenization method inside a representative volume element (RVE). Evolution equation formed by tensor representation is derived from very simple micro-evolution equation. It has incremental form obtained by Vakulenko's concept of thermodynamic time. The rate dependence takes place by means of stress rate dependent value of the initial yield stress. Strain geometry is based on constrained micro and free macro rotations in intermediate reference configuration. This leads to the fact that evolution equation for plastic spin of RVE is an outcome of evolution equation for plastic stretching. The theory is applied to slightly disordered fcc-polycrystals. For some characteristic given stress histories (with low, medium and high strain rates) the micro-meso transition is tested and number of active slip systems grains are found and compared with so-called J2-approach.

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