# An FFT based strain gradient crystal plasticity study of grain boundaries

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## ABSTRACT

Finite strain FFT based crystal plasticity formulation is extended to account for the strain gradient effects by explicitly incorporating the geometrically necessary dislocations densities (GNDD) along with the statistically stored dislocation densities (SSDD) at a slip system level. The evolution of GNDD is calculated using the Nye tensor while that SSDD follows the classic Kocks- Mecking approach. Initially, we report on the convergence behaviour and the mesh sensitivity of the implementation on an RVE consisting of two crystals with different plastic properties. Subsequently, the variation in the local fields with and without the gradient plasticity are presented. Further, we report on the correlation between the local accumulation of GNDDs and different metrics used to quantify a grain boundary such as disorientation angle, various slip transmission criteria like Luster-Morris parameter, residual Burgers vectors, Taylor factor difference etc.

Keywords : Strain gradient CPFFT, slip transmission criteria, geometrically necessary dislocation densities, grain boundaries

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