

[PO-C2]Poster Session 2

Symposium C

2018年10月31日(水) 17:45 ~ 20:00 Poster Hall

[P2-24]A 2D MESOSCALE STUDY OF DISLOCATIONS, CRACKS AND MARTENSITIC PHASE TRANSFORMATIONS

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TRIP-Steels are of commercial interest due to their exceptional strength. This is a result of the microstructure; a matrix of both austenite and martensite that when plastically strained, exhibits strain hardening behavior. Plastic deformation arises from the presence of dislocations and the martensitic phase transformations (MT) that take place inside the metal. To understand the macroscopic properties of TRIP-Steels, it is necessary to understand the underlying dynamics occurring at the mesoscale.

Most models do not take into account the interactions between martensitic phase transformations and dislocations, and therefore are missing the impact that these two phenomena exert on each other. While MD simulations can resolve both phenomena naturally, they are prohibitively expensive for larger crystal sizes or time scales. On the contrary, continuum models cannot resolve the motion of dislocations inside the material.

We combine dislocation dynamics and martensitic phase transformations to study the interplay between the two phenomena. For the dislocation problem we use a continuum dislocation dynamics (CDD) model, allowing us to reduce computational cost and increase the system size. CDD is coupled with a Phase Field approach, which we use to model martensitic phase transformations. This allows us to study how dislocation motion can be influenced in the presence of an MT. Additionally, simple crack geometries can also be modeled as special dislocation configurations, which helps to understand how cracks and voids may trigger or inhibit MT.