

Achievements and perspectives on Phase Field modeling of Martensitic Transformation

B. Appolaire (1,2), Y. Le Bouar (2), A. Finel (2)

(1) Institut Jean Lamour, Université de Lorraine

(2) Laboratoire d'Étude des Microstructures, CNRS-ONERA

The phase field approach has progressively invaded the field of materials science these last 25 years to become one of the most popular approach to compute microstructure formation and evolution.

In this talk, I will give a small overview of the historical development of the approach to explain why two kinds of phase field models are used to describe martensitic transformations:

(i) models with an order parameter indirectly coupled with displacements through some eigenstrain;

(ii) and models with strain components as the order parameters themselves.

I will explain their very difference from a physical point of view before discussing their pros and cons, including their implementation with different methods.

I will illustrate their respective achievements taking examples from the literature or from fresh calculations, so as to give the broadest possible overview of the different issues addressed with the phase field approach (besides the nice pictures that are usually shown).

I will finish my talk by giving some perspectives with the emerging trends in the phase field community, together with some advices to potential newcomers.