Heterogeneities in Martensite Through Controlled Deformation in Austenite

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ABSTRACT

This study involved high temperature deformation of high strength martensitic steel. Deformation in the parent austenite, through shape rolling and/or controlled hot compression, showed microstructural heterogeneities. Martensite-to-austenite reconstruction was executed using pixel-by-pixel technique that brought out misorientation within austenite grains. In particular, introduced plastic strain (as estimated by finite element simulations) scaled with misorientations in the austenite. These appeared to control the variant selection, and potential cause for heterogeneities. This study was then extended to include controlled hot compression in a deformation simulator. Variant selection, in such samples, were observed to depend on the parent austenite orientation (and the estimated Bain strain), grain size and misorientation. An artificial neural network was used to bring out relative dependence of these individual factors on the martensite variant selection during hot working.

Keywords: Hot Deformation, Austenite reconstruction, Plastic Deformation, Variant Selection, Microstructure.

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