

Multiscale Modeling of Steels assisted by Transformation-Induced Plasticity**Sergio Turteltaub, A.S.J. Suiker***Faculty of Aerospace Engineering, Delft University of Technology, Delft, The Netherlands*

The favorable combination of strength and ductility in carbon steels whose mechanical response is enhanced by transformation-induced plasticity has been attributed to the effect of islands of retained austenite in the initial microstructure. The mechanical response of these steels depends on the interaction of several phases present in the mesoscale structure (ferrite, bainite and retained austenite). In turn, the evolution of retained austenite depends on smaller scale phenomena, particularly its transformation into twinned martensite. We develop a model for retained austenite where the effects of the substructures is accounted for via a homogenization procedure and the mesoscale behavior is modelled numerically via a three-dimensional analysis of a representative inclusion. The analysis is carried out for different morphologies of the islands of retained austenite as well as the surrounding phases.

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