

Twinning induced plasticity during yield point elongation in medium manganese steels

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Medium Mn steel with a dual phase microstructure of austenite and ferrite has shown an undesirable yield point phenomenon with large yield point elongation (YPE). Managing the YPE requires an understanding of the deformation mechanisms that operate in ferrite and austenite during YPE. In this paper, deformation mechanisms that operate during YPE of cold rolled Fe-5Mn-0.2C-0.8Si-0.34Al medium Mn steels are reported. It was observed that the transformation induced plasticity (TRIP) and twinning induced plasticity (TWIP) occurs in austenite phase during YPE. The reason for observing both TRIP and TWIP is attributed to differences in Mn concentration in austenite grains which changes the stacking fault energy (SFE) and thereby influences the plasticity mechanisms. To the best of our knowledge this is the first evidence of both TWIP and TRIP activity observed during YPE in medium Mn steel.

Keywords: Medium Mn steel, Yield point elongation, stacking fault energy, martensitic transformation, nano-twins.

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