Phase Boundary Decoration States in Medium Mn Steels

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Optimizing the mechanical performance of lean, cost-efficient alloys through controlled solute decoration at dislocations, grain boundaries, and facets is a key strategy in segregation engineering. Medium-Mn steels, with their multiphase microstructures and high density of interfaces, are particularly sensitive to thermomechanical treatment. This study investigates the microstructural evolution of Fe-10Mn-3Al-0.2C wt.% medium Mn alloy, annealed at 450°C for varying durations (2, 50, and 200 hours), using Scanning Electron Microscopy (SEM), Electron Channeling Contrast Imaging (ECCI) and Atom Probe Tomography (APT). Transmission Electron Microscopy (TEM) is employed to explore the crystallographic origins of solute segregation at phase boundaries, dislocations, and facets.

Keywords: SEM, APT, Grain and phase boundary segregation