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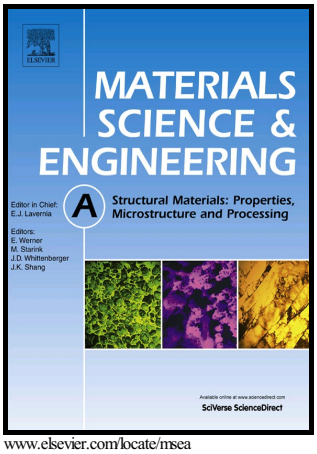

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Effects of alloying addition on deformation mechanisms, microstructure, texture and mechanical properties in Fe-12Mn-0.5C austenitic steel

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Abstract

In the present investigation, the dependence of deformation mechanisms on quaternary alloying addition has been investigated for medium Mn austenitic steel. A steel with composition Fe-12Mn-0.5C-X (X: Ni and Al), a medium Mn austenite steel was deformed up to 60% by cold reduction to investigate the deformation mechanisms and texture evolution. Electron Back-scattered Diffraction (EBSD) and X-ray bulk texture measurement have been performed to study the deformation behaviour. Deformed microstructure with increasing strain was systematically analyzed with respect to the alloying addition. SFE of the alloy can be tailored by the addition of alloying elements. In the present investigation, SFE has been tailored by addition of Carbon, Aluminium and Nickel. The highest deformation twin fraction has been observed in Ni added sample and the lowest in the Al-added sample. Visco plastic self-consistent (VPSC) simulation has been performed to understand the contribution of slip and twin activity during deformation.

Keywords: TWIP steel, texture, microstructure, twin, VPSC, mechanical properties