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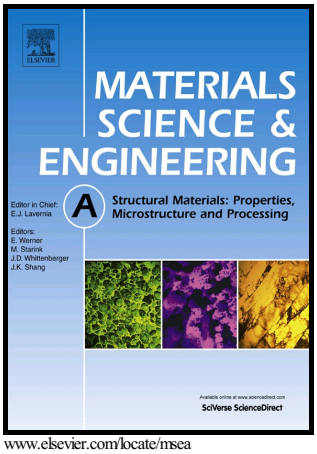

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ACCEPTED MANUSCRIPT

Microstructure and tensile behavior of Fe-8Mn-6Al-0.2C low density steel

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Abstract: The microstructure and tensile behavior of Fe-8Mn-6Al-0.2C low density steel were investigated in the present study. The results show that, after being solution treated at 900°C for 1h, the steel has a duplex microstructure consisting of ferrite and ~ 30% austenite, and it exhibits an excellent combination in mechanical properties, with a tensile strength of 846 MPa and a total elongation of 32%, which were attributed to significant contribution of TRIP effect and three stages work hardening behavior. During tensile test, the work hardening behavior can be defined as three-stage characteristics, in which the stage 2(S2) was linked to the TRIP effect. In S2, with the increase of tensile strain, austenite volume fraction decreased while martensite volume fraction increased gradually. During this process, some austenite grains, positioned at grain boundaries among multiple ferrite grains, were the first ones to transform, while, some austenite grains, located between ferrite laths or embedded in large ferrite grains were often found to undergo rotations. The TRIP effect and the high dislocation density in ferrite and martensite significantly contributed to the excellent mechanical property. In addition, the volume fraction of small angle grain boundaries increased greatly, with a value of over 51% being observed at the true strain of 0.27. The steel possessed a density of 6.95g/cm^3, which

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