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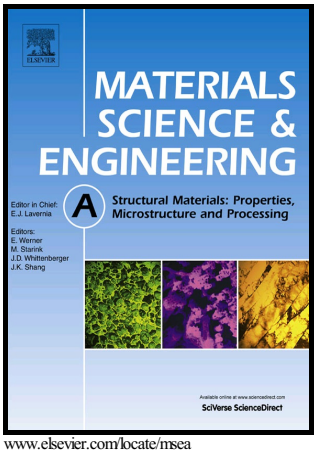

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Strengthening behaviors of V and W modified Cr19 series duplex stainless steels with transformation induced plasticity

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Abstract: The V and W modified Cr19 series duplex stainless steels with transformation induced plasticity (TRIP) have been newly developed and the effects of microstructures on room temperature mechanical properties have been investigated. The addition of ferrite forming elements V and W slightly increases the volume fraction of ferrite phase from about 55 to 57-60%, however, the cold rolling process hardly influence the fraction. When the duplex phases exhibit a coarse banding morphology before cold rolling, the ultimate tensile strength and elongation are improved significantly with the addition of V and W elements mainly due to the occurrence of TRIP effect. The ultimate tensile strength and yield strength of Cr19+V increase very slightly, but the elongation increases to about 61% after cold rolling. Both the ultimate tensile strength and elongation of Cr19+W significantly increase to about 800 MPa and 67%, respectively. The improvement is attributed to TRIP effect and refinement of banded ferrite and austenite phases. After aging heat treatment, the precipitate of VN and $Cr_{23}C_6$ particles contributes to the further increase of ultimate tensile strength to about 1000 and 920 MPa of Cr19+V and Cr19+W DSSs, respectively. Strain induced α' -martensite is transformed from austenite directly with an orientation relationship. The strengthening behaviors have been discussed based on the microstructural evolutions.

Key words: Duplex stainless steels, Transformation induced plasticity, Mechanical properties, Microstructures, Strengthening behaviors.

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