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Martensite transformation behavior and mechanical properties of cold-rolled metastable Cr-Mn-Ni-N austenitic stainless steels

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Abstract

In order to understand the mechanism of substitution for nickel with manganese in metastable austenitic stainless steels 14Cr10Mn and 16Cr6Mn, the transformation behavior of ϵ - and α' -martensite and the corresponding mechanical properties were investigated in this study. The microstructures and tensile and hardness properties of the cold-rolled steels under different rolling reductions at ambient temperature were measured using X-ray diffraction (XRD), scanning electron microscope (SEM) together with an electron back scatter diffraction (EBSD) and transmission electron microscope (TEM). The results show that α' -martensite is not easy to be transformed from austenite, and the martensite transformation $\gamma \rightarrow \epsilon \rightarrow \alpha'$ in 14Cr10Mn and 16Cr6Mn metastable stainless steels is found during cold rolling. The results also reveal that ϵ -martensite acts as an hardness reinforcing phase, and high total martensite volume fraction and ratio of ϵ - and α' -martensite content are helpful to achieve higher tensile strength

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