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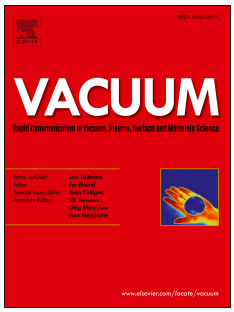

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Fine-grained dual phase steel via intercritical annealing of cold-rolled martensite

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Abstract

The effect of intercritical annealing on the microstructure and mechanical properties of a low carbon steel with the chemical composition (wt%) of 0.12C-1.11Mn-0.16Si is studied. The cold rolled martensite and ferrite-pearlite microstructure are considered as the starting microstructures for producing dual phase (DP) steels. It is revealed that intercritical annealing of cold-rolled martensite is a viable technique for grain refinement of DP steels, where a microstructure consisting of ferrite grains with average grain size of less than 5 μm and fine martensite islands can be easily obtained. This DP steel exhibits much better strength-ductility balance compared with that obtained by intercritical annealing of the ferritic-pearlitic microstructure due to much finer microstructure and enhancement of work-hardening behavior in the former. The fine-grained microstructure is also obtained at higher intercritical annealing temperatures for the aim of increasing the volume fraction of martensite. Accordingly, the work-hardening response and the overall mechanical properties are enhanced.

Keywords: Dual phase steels; Grain refinement; Mechanical properties; Strain hardening rate.

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