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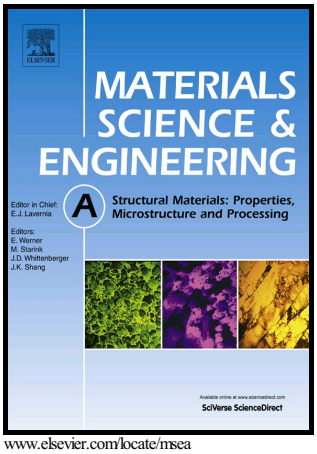

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Effect of microstructural refinement and intercritical annealing time on mechanical properties of high-formability dual phase steel

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Abstract

The impact of the intercritical annealing time and refinement of microstructure upon the tensile properties and work-hardening capacity of a dual phase (DP) steel were evaluated. For the undeformed pre-intercritical microstructures, the sensitivity of the obtained DP microstructures on the time of annealing was low, and in all cases, a relatively coarse microstructure was obtained. It was shown that a fine-grained DP steel with chain-network martensite morphology can be readily obtained by carefully controlled intercritical annealing of a cold deformed martensitic microstructure. By continued intercritical annealing beyond the optimum value, the growth of ferrite grains and fading of the chain-network martensite morphology were found to be responsible for the lowering of work-hardening rate and obtained tensile properties. By optimization of the intercritical annealing condition, a DP300/600 steel with high work-hardening rate, low yield ratio, high tensile toughness, and good ductility was obtained, which exhibited significant enhancements compared with the conventional DP350/600 grades.

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

1. Introduction

One of the main targets of automobile manufacturers is to reduce the consumption of gasoline through the reduction of the weight. This can be achieved via thinner gauges of the parts, where, in