

Comparison of the formability of ultra-high strength austenitic reversion-treated and cold-rolled steels

The effect of microstructure on formability of ultra-high-strength austenitic steel

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Abstract. Two approaches were used to study the microstructure, mechanical properties and formability of ultra-high-strength austenitic structures with different microstructural features created by: 1) reversion treatment and 2) temper rolling. Reversion treatments were carried out for 55% cold rolled AISI 301LN sheets using a 600 kW pilot induction heating line. Commercial cold-rolled AISI 301 was selected as a reference material. X-ray diffraction was used to examine the phase fractions and electron backscatter diffraction for grain size estimations. Tensile properties were determined using tensile and hardness tests and the stretch formability by Erichsen cup tests. The yield strength of the fine-grained reversed structures varied in the range of 800...1100 MPa, whereas the reference structure had the yield strength of 1200 MPa. The stretch formability was clearly better in the more ductile reversion-treated specimens than in the cold-rolled counterpart. Evidently, the presence of retained and/or deformed grains impaired the formability, but in the partially reversed structures, the formability was surprisingly good despite the presence of retained phases.