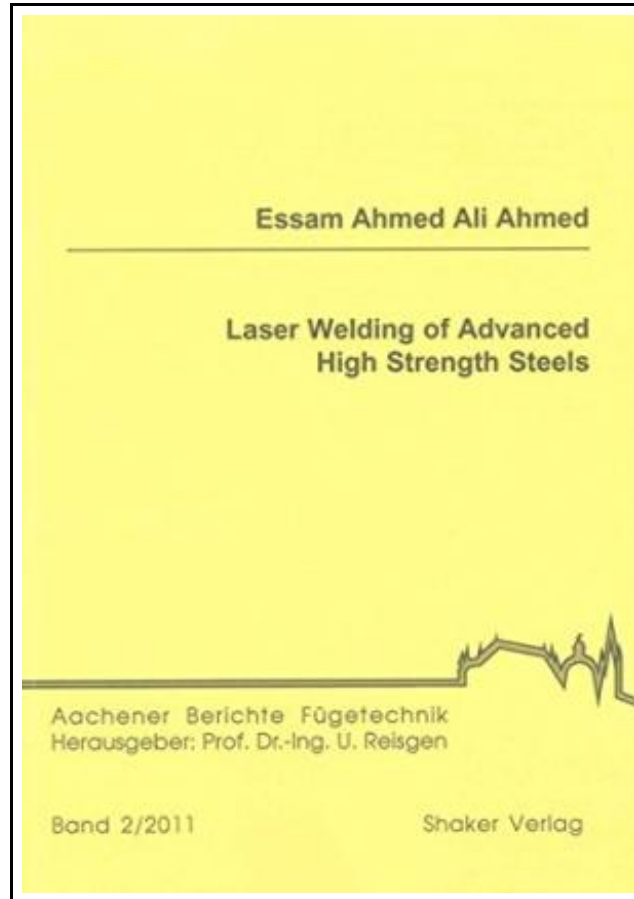


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Shaker Verlag Apr 2011, 2011. Taschenbuch. Book Condition: Neu. 209x151x13 mm. Neuware - This research work focuses on characterization of CO₂ laser beam welding (LBW) of dual phase (DP) and transformation induced plasticity (TRIP) steel sheets based on experimental, numerical simulation and statistical modeling approaches. The experimental work aimed to investigate the welding induced-microstructures, hardness, tensile properties and formability limit of laser welding butt joints of DP/DP, TRIP/TRIP and DP/TRIP steel sheets under different welding speeds. The effects of shielding gas types and flow rates on the weldability of DP/TRIP steel sheets were also studied. The simulation of laser welding of DP/TRIP steel sheets through welding induced temperature field, thermal cycles, residual stresses and distortions using Sysweld 2010 software v12.0 was the second goal of this research. Also stretch formability (Erichsen test) was simulated in this step using Abaqus/CAE software v6.9-1. The aim of statistical modeling was to predict and optimize laser welding of DP/TRIP steel sheets in industry through applying a three-factor-three-level Box-Behnken statistical design with full replication as a design of experiment (DoE) approach to design the experiments, develop mathematical models and optimize the welding operation. This was achieved by controlling selected welding parameters: laser power, welding speed and focus position. The experimental results showed that the CO₂ LBW is a successfully welding process for butt joining of DP and TRIP steels sheets. The LBW of DP/TRIP steel sheets is successfully numerically simulated using the finite element (FE) code SYSWELD when using a 3D Gaussian distribution heat source model with a conical shape. There are good agreements between the experimental- and FE- results during simulation of stretch formability of DP/TRIP steel weldments when using von Mises yielding model as yielding criterion. Statistically, mathematical models were developed to predict the required responses (mechanical properties, weld bead geometry and unit welding...

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