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Laser welding parameters that influence martensite formation in 409 stainless steel

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Resumo:

Automotive exhaust systems are essential for managing and expelling exhaust gases from internal combustion engines and require materials that can withstand high temperatures, corrosive environments, and mechanical strength. Stainless steel has become the preferred material for these systems owing to its excellent corrosion resistance, cost-effectiveness, mechanical strength, and formability. Ferritic stainless steel can suffer from resistance to corrosion and strength reduction due to the grain growth at the heat-affected zone. Furthermore, the martensite at the fusion zone can affect the forming properties with cracks in the fusion zone during the fabrication process. For this study, three welding parameters were used for welding samples. The welding samples were tested in expansion tests, bending test, Erichsen tests for forming evaluations, and Vickers microhardness for microstructural evaluations. To the best knowledge, no studies of CO₂ laser welding with an evaluation of microstructure influences in forming processes. The welding parameters in our

study do not affect the heat-affected zone width, Vickers hardness and mechanical properties.