



Online Perspectives Journal: Exact & Engineering
Proceedings of the 7th International Congress on Scientific Knowledge
6th Research & Development PROVIC/PIBIC
Vol. 11, Issue 33, Supplement, 2021

Analysis of post-weld heat treatments of AISI 2205 duplex stainless steel

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Duplex stainless steels are essential for many industries. Regularly used in highly aggressive environments, they often undergo a welding process, whether for joining components or repair operations. This process can modify the ferrite/austenite ratio and form secondary phases, impairing its properties. As a result, in some cases, it is recommended that post-welding heat treatment be carried out to restore the mechanical and metallurgical properties of the welded joint. In this work, the effect of solubilization heat treatment on the mechanical properties of duplex stainless steel welded joints by the autogenous Tungsten Inert Gas (TIG) process is studied. A systematic review was performed in the Scopus database to understand the effects of post-welding heat treatments on microstructure, hardness, tensile and impact behavior. Two solubilization temperatures were chosen through this review: 1050 °C and 1150 °C during 15 min. These thermal treatments were carried out in 3 tensile test specimens of each condition studied, including the welded joint without any heat treatment, called as-received condition. The heat treatments resulted in higher elongation and lower yield stress and stress strength. The one-way ANOVA showed no significant difference between yield strength, tensile strength and elongation between heat-treated conditions specimens. Although, the region where the specimens fractured varied. In the future, a microstructural characterization will be performed to understand the mechanical behavior observed.

Keyword: mechanical behavior; solution heat treatment; fracture.

Supported by: ISECENSA; PROVIC.