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MICROGRAPHIC STUDY OF WELDED JOINTS IN ALUMINUM ALLOYS BY MIG PROCESS

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ABSTRACT

The objective of this work is to analyze and evaluate the influence of thermal treatments of solubilization, tempering and aging sequence, made in the 6082 - T6 alloy, previously welded by the MIG (Metal Inert Gas) welding process.

In this work, a microscopically analysis of the welded and a thermally treated joint is realized, to evaluate the microstructure quality and the results found by varying the time and temperature during the treatment. In addition, it is intended to verify the influence of the waiting time amongst the heat treatment of quenching and artificial aging.

Keywords: Robotic welding, MIG welding, Alloy AA-6082-T6, Solubilization, Quenching, Artificial aging, Thermal treatments, Micrographic analysis.

INTRODUCTION

Aluminum is a lightweight, ductile, corrosion resistant, non-toxic, good heat conductor, good conductor of electricity and processable, to have good flow and resistance limits (Souza, 2015), thus, due to its good characteristics and properties it is so widely employed.

The welding is a very usual and important, which is why, it is essential to acknowledge the effects and problems generated during the welding process to guarantee the quality of the joint and the final product. The main defects of the welds are porosities, oxide inclusions, formation of surface oxide films, hot cracking during solidification, non-melting, and reduction of corrosion resistance (Mathers, 2012). In aluminum alloys, heat treatment is of great importance as it is commonly used to recover the mechanical properties after the welding process. Heat treatment improves the strength of aluminum alloys by a process known as precipitation hardening, which occurs during heating and cooling of an aluminum alloy and in which forms the precipitates in the aluminum matrix (Mohamed, Samuel, 2012).

This work carries out 18 different cycles of thermal treatments and after that, it holds a micrographic analysis to evaluate which cycle presented the best results in the matter of recovery of the mechanical properties after the welding.

RESULTS AND CONCLUSIONS

The best-performing thermal cycle was found for the combination one (test 1), in which the sample was solubilized for 90 minutes at temperature of 520 ° C, then tempered and finally aged

at 190 ° C for 20 hours. Test one shows an ideal micrograph, presenting uniform precipitates in size and distribution throughout the matrix and thus displacements are unable to cut precipitates, increasing strength and hardness.

Presented below are the micrographs of assay number one, in Figure 1, where they indicate the micrographs of the base metal, Heat Affected Zone – HAZ, and melt zone, respectively.

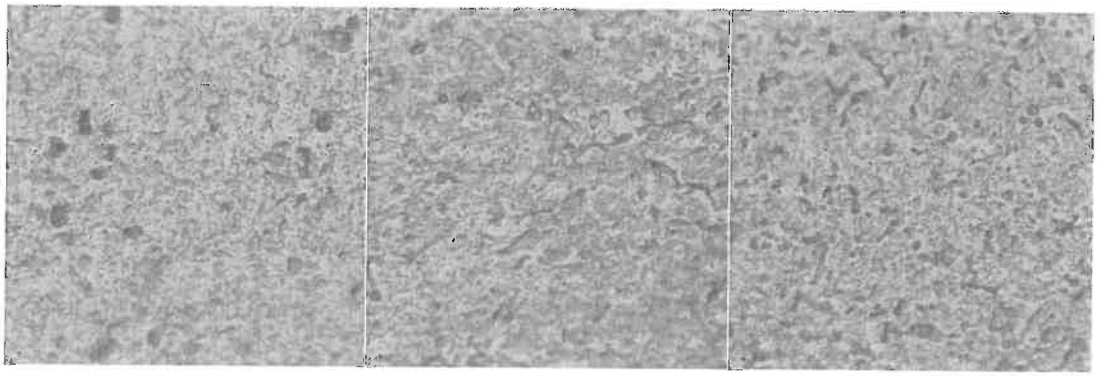

Figure 1 - Micrographs of the test number 1

The regions with the most noticeable changes in micrography were HAZ and weld. In Figure 1, in these regions, it is possible to observe a microstructure with an optimal size and distribution of the precipitates for the hardening and where, theoretically, the maximum hardness value is reached.

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