

عنوان مقاله:

Investigating the heat input effect of the GTAW process upon the microstructure and HAZ extension of HSLA-100 steel weld joints using thermal cycles

محل انتشار:

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خلاصه مقاله:

In the current research, the welding of HSLA-100 steel was accomplished with three different heat inputs using the GTAW process. The microstructure of various joint zones was investigated utilizing an optical microscope and scanning electron microscope. For the purpose of assessing the impact of thermal cycles upon the extension and alterations in the heat-affected zone, the thermocouples were placed at distinct distances from the fusion line. The results indicated that the weld metal microstructure comprised of acicular ferrite and a number of polygonal and quasi-polygonal Ferrite with M/A constituent. An epitaxial growth was observed in the fusion line in all heat inputs. It was determined that the heat-affected zone microstructure consisted of two regions, namely a coarse-grained heat-affected zone with a granular and lath bainite microstructure and a fine-grained heat-affected zone with the prevailing microstructure of granular Bainite. The results indicated that increasing the heat input leads to a decrease in the amount of acicular ferrite and M/A constituent volume fraction in the weld metal and an increase in lath bainite in coarse-grained zone. It was found that by increasing the heat input from 0.78kJ/mm to 1.42 kJ/mm, the grain size increases from 29.2 μ m to 76.5 μ m and from 15.7 μ m to 32.5 μ m in coarse-grained and fine-grained zone, respectively. The thermal cycles evaluation pertinent to the implanting of a thermocouple disclosed that the heat-affected zone width is extended from 3.6 mm to 4.5mm by increasing the heat input from 0.78kJ/mm to 1.42 kJ/mm.

کلمات کلیدی:

HSLA-100 steel, Microstructure, Thermal cycles, granular bainite, acicular ferrite, M/A constituent

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