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Microstructure and mechanical properties of underwater wet welded high-carbon-equivalent steel Q460 using austenitic consumables

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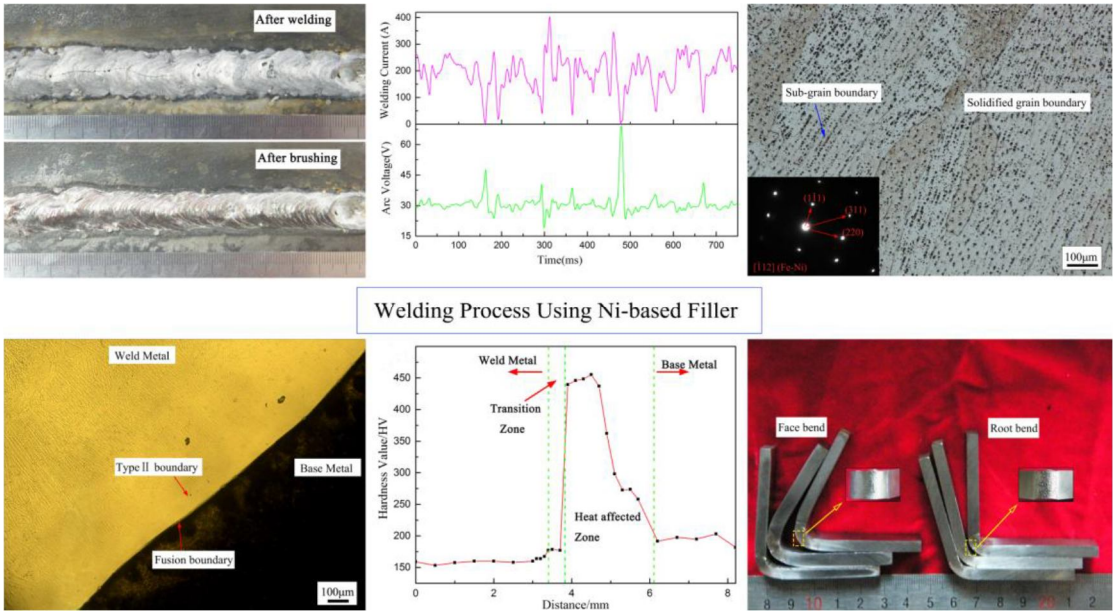
Abstract

Underwater wet flux-cored arc welding of Q460 steel using specially developed Ni-based filler and commercially obtained ER308 were investigated. Wet welded joints using Ni-based filler were of high performance with high ultimate tensile strength (518 MPa) and impact toughness of the weld metal (128.9 J/cm^2). ER308 failed to acquire sound welded joints due to extensive slag remained in the bottom of groove. The highest microhardness (450 HV) was recorded on the coarse-grained heat-affected zone of the base metal for both joints. Type Ⅱ boundaries existed in the interfaces between austenitic weld metal and ferritic base metal. Compared to austenitic stainless steel weld metal, nickel-based weld metal possessed the ability to be significantly diluted by Q460 base metal.

Graphical Abstract



Key words: Q460 steel; Underwater wet welding; Flux-cored wire; Microstructure; Mechanical properties

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