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ACCEPTED MANUSCRIPT

Laser Weldability of Zr-2.5Nb Alloy to AISI 410 Stainless Steel with Ni Filler

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ABSTRACT

The nickel interlayer improved the laser weldability of Zr-2.5Nb to AISI 410 stainless steel. The fusion zone contained a large amount of refined and tough dendritic γ -Ni(Fe, Cr) solid solution (182~268 HV), while the brittle Zr(Fe, Cr)₂ intermetallic compound (1,171~1,460 HV), which was the main phase as the result of direct welding of Zr-2.5Nb to SS410 as well as the source responsible for the welding cracks, disappeared. Only limited quantities of Zr₂(Ni, Fe), Zr₇Ni₁₀ (and/or Zr₂Ni₇) intermetallics were present mainly in the form of thin layers (less than 200 µm thick in total) near the fusion interface with Zr-2.5Nb. Those Zr-Ni based intermetallics showed relatively higher toughness and lower hardness (301~497 HV) than the brittle Zr(Fe, Cr)₂, which reduced the overall cracking sensitivity of the laser-weld.

Keywords: Dissimilar metal joining Laser beam welding Zr-2.5Nb AISI 410 stainless steel Ni interlayer Download English Version:

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