

Effect of solution treatment temperature on the precipitation kinetic of δ -phase in 2205 duplex stainless steel welds

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Abstract: The effect of the prior solution treatment temperature on the δ -ferrite transformation in 2205 duplex stainless welds after aging at 850 °C has been studied. Microstructural examination showed that the δ -phase and $M_{23}C_6$ chromium carbides precipitate at the δ/δ interfaces and within the δ -ferrite grains. Increasing the solution treatment temperature from 1050 to 1250 °C delays the δ -phase formation and favours the precipitation of intragranular secondary austenite δ_2 . The simulation of the δ -phase precipitation kinetic in the base metal, HAZ and weld metal, indicates a good agreement between the experimental fitted data and the modified Johnson–Mehl–Avrami model. The results indicate a marked sensitivity of the δ -phase precipitation kinetic to the solution treatment temperature. A high precipitation rate corresponds to a fine grained structure with ferrite enriched in δ forming elements (Cr, Mo)

Keywords : duplex stainless steel, welding, ageing, precipitation kinetic, Johnson-Mehl-Avrami model