Effect of Nb Content on Mechanical and Intergranular Corrosion Resistance of QN1804 Stainless Steel

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Abstract QN1804 building stainless steel has heat affected zone (HAZ) in the cooling process after welding, which makes QN1804 stainless steel sensitized, leading to intergranular corrosion cracking and mechanical failure of QN1804. This experiment mainly aims at this phenomenon and proposes to add QN1804 stainless steel with different Nb contents to improve the intergranular corrosion resistance of QN1804 and reduce the intergranular sensitivity of QN1804. Finally, the optimal Nb addition process is obtained. The results show that with the increase of Nb content, the microstructure refines obviously, and the mechanical properties increase first and then decrease. With the increase of Nb content, the precipitated phase in the microstructure changes from intergranular $M_{23}C_6$($Cr_{23}C_6$) phase to intragranular NbX phase and Z phase (NbCrN) with random distribution, thus improving the intergranular Cr-poor zone. The results of DL-EPR showed that the intergranular sensitivity of QN1804 decreased with the increase of Nb content. The intergranular corrosion test of 50% H_2SO_4-Fe_2SO_4 showed that the corrosion weight loss rate decreased with the increase of Nb content, from 1.75mg/cm^2 of 0wt% Nb to 1.24mg/cm^2 of 0.10wt% Nb by 29.1%. The corrosion morphology was improved, from severe intergranular corrosion to local pitting corrosion and pitting corrosion link at grain boundary. The comprehensive performance of QN1804 with 0.05wt% Nb content was the best.

Keywords QN1804, Nb addition, Intergranular corrosion, Intergranular sensitization

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