18、Corrosion of Light Alloys & Nonferrous Metal

Influence of rolling and subsequent aging treatment on corrosion resistance of IN625 alloy to aqueous HF acid solution

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Abstract Because of its excellent mechanical properties and corrosion resistance, IN625 alloy has been widely used in gas turbine, nuclear power generation and chemical processing applications, where operating conditions are extremely harsh. Manufacturing the parts made of IN625 alloy are inevitably subjected to plastic deformation and/or subsequent heat treatment. Unfortunately, large plastic deformation can readily lead to localized deformation of alloy matrix. In addition, due to the high content of refractory elements such as Cr, Mo and Nb in IN625 alloy, a large number of secondary phases may also appear during the heat treatment. The abovementioned microstructure variation during the thermomechanical processing can give strong impact on corrosion resistance of alloy. Therefore, understanding the relationship among the microstructural evolution, mechanical property as well as corrosion resistance is vital for improving the overall performance alloy. So, this study examined the effect of rolling and subsequent aging treatment on corrosion resistance of IN625 alloy to 5.2M HF acid solution at 100 °C. The rolling was conducted at 700 oC to reduction rates of 20%, 50% and 80%. The subsequent aging treatment was conducted at 800 oC for 10 h and 100 h, respectively. Microstructural characterisations revealed that both rolling and aging have a detrimental effect on corrosion resistance, although the mechanical property of alloy was enhanced significantly. The lowered corrosion resistance by rolling can be ascribed to the localized deformation of alloy matrix during rolling, while by aging the lowered corrosion resistance can be correlated to the presence of large number of Nb3Ni delta phase, which is detrimental to the corrosion resistance of alloy matrix by forming galvanic corrosion.

Keywords IN625 alloy; Corrosion; HF acid solution; Rolling; Aging treatment.

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