
Study on the Corrosion Mechanism of Nickel-based Superalloy GH4169 at High Temperature

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Abstract As a widely used nickel-based superalloy, it is not clear that the growth mechanism of the oxide layer of GH4169 in air at 800°C. Therefore, studies on the corrosion of GH4169 in air at different times were conducted, and were analyzed using multi-scale characterization techniques. The results indicated that as the oxidation time increased, the grain boundaries gradually emerged, and the oxide skins gradually peeled off. The oxide layer was divided into two layers. The upper layer contained abundant Fe oxides and Ni oxides, and gradually formed composite oxides. The lower layer was a dense and continuous Cr₂O₃ layer, and as the oxidation time increased, the thickness of the Cr₂O₃ layer increased, hindering further oxidation of the matrix. In the middle of the oxide layer, there were abundant Nb, Mo, Al, and Ti. The fluctuations in the weight of alloy oxidation could be attributed to the cracking of the Ni₃Nb phase and the rapid formation of the oxide layer.

Keywords Nickel-based superalloy, High temperature, Corrosion