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PROCEEDINGS

An Investigation of Low/High Temperature Hot Corrosion Mechanism in a Ni-Base Superalloy Coated with Na_2SO_4+NaCl Salt Mixture

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ABSTRACT

Hot corrosion behavior of GH4169 nickel-based superalloy coated with 95wt.%Na_2SO_4+5wt.%NaCl salt mixture at 650 ℃,800 ℃, and 950 ℃ were investigated by some material characterization methods. The Experimental results showed that hot corrosion kinetics followed a parabolic, linear and exponential laws at 650 ℃, 800 ℃, and 950 ℃ respectively. Notably, as the temperature ascended from 650 ℃ to over 800 ℃, the corrosion mechanisms underwent a transition from pit corrosion to uniform erosion, corresponding to low-temperature hot corrosion (LTHC) and high-temperature hot corrosion (HTHC). At 650 ℃, a large number of semi-ellipsoidal corrosion pits manifested on the surface. Conversely, at 800 ℃ and 950 ℃, the near-surface corrosion layer exhibited nearly uniform spallation. Hot corrosion resulted in the deterioration of the protective oxide film on the superalloy surface by the salts, allowing external elements such as O, S, and Cl to infiltrate the GH4169 substrate through defects in the oxide film. As a result, internal oxidation, internal sulfidation, and internal chlorination reactions occurred in the subsurface of the superalloy, resulting in a visible corrosion layer on the cross section consisting primarily of oxides and sulfides.

KEYWORDS

Hot corrosion; salt mixture; Ni-base superalloy; temperature; corrosion pits; spallation

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