

MmeMac09-001

Comparative analysis of thermal aging effects on austenitic steel 310 variants: commercial VS. novel nitrogen-niobium alloyed

Garcia, J.M.(1); Nunes, T.S.(2); De Sousa, T.G.(3); Brandao, L.P.(1); (1) IME; (2) UEZO; (3);

Austenitic steel 310 plays a vital role in industries operating under extreme temperatures. In this contest, the present study investigates a comparative analysis between two variants of austenitic steel 310: a commercially available (AISI 310) and a novel steel alloyed with nitrogen and niobium (310-Nb). Exploring the effects of thermal aging on microstructural evolution and phase stability. Thermal aging experiments were conducted at 675°C for different durations: 20 hours, 140 hours, and 310 hours for the AISI 310, and 20 hours, 250 hours, and 325 hours for the 310-Nb. Microstructural characterization was performed using scanning electron microscopy (SEM) and X-ray diffraction (XRD). The AISI 310 exhibited the formation of sigma phase with prolonged aging, indicating reduced structural stability. In contrast, the 310-Nb demonstrated enhanced structural stability, characterized by the absence of sigma phase formation during the studied times. Furthermore, the alloyed variant exhibited the stabilization of carbon (C) in NbC precipitates rather than forming Cr23C6, suggesting improved precipitation kinetics. These findings underscore the advantageous effects of nitrogen and niobium alloying on the thermal stability and precipitation behavior of the 310 austenitic steel.