

Isothermal oxidation behavior of Fe-33Ni-18Cr alloy in different heat treatment temperature

Abstract

This research study describes the influence of different heat treatment temperature on isothermal oxidation of Fe-33Ni-18Cr alloy. The Fe-33Ni-18Cr alloy was undergone heat treatment at three different temperatures, namely 1000 °C, 1100 °C and 1200 °C for 3 h soaking time followed by water quench to vary the grain size of the alloy. This alloy was ground by using several grit of silicon carbide papers as well as weighed by using analytical balance and measured by using Vernier caliper before oxidation test. The heat-treated Fe-33Ni-18Cr alloy was isothermally oxidized at 800 °C for 150 h. The characterization of oxidized samples was carried out using optical microscope, scanning electron microscope equipped with energy dispersive x-ray (SEM-EDX) and x-ray diffraction (XRD). The results showed that, increasing the heat treatment temperature was increased the average grain size. The kinetics of oxidation followed the parabolic rate law which represents diffusion-controlled oxide growth rate. Fine grain structure of 1000 °C sample shows minimum weight gain and lower oxidation rate compared to samples of 1100 °C and 1200 °C that indicated oxide spallation and porous structure. Besides, phase analysis showed that the oxidized sample formed several oxide phases.

Keywords

Alloy 800H; Fe-33Ni-18Cr alloy; Heat treatment; Isothermal oxidation; Ni-based alloys; Surface morphology