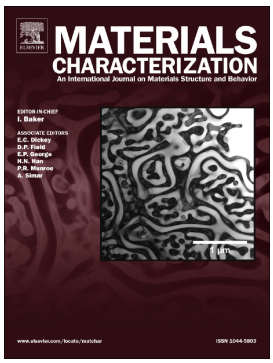

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PII: S1044-5803(17)30969-5
DOI: doi:10.1016/j.matchar.2017.11.038
Reference: MTL 8927

To appear in: *Materials Characterization*

Received date: 5 April 2017
Revised date: 20 October 2017
Accepted date: 18 November 2017

Please cite this article as: Dening Zou, Yuqing Zhou, Wei Zhang, Ying Han , High temperature oxidation behavior of a high Al-containing ferritic heat-resistant stainless steel. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Mtl(2017), doi:10.1016/j.matchar.2017.11.038

High Temperature Oxidation Behavior of a High Al-containing Ferritic Heat-resistant Stainless Steel

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Abstract: The high temperature oxidation behavior of a high Al-containing ferritic heat-resistant stainless steel at temperatures of 800, 900, and 1,000°C in air were studied in isothermal oxidation tests. The results showed that the isothermal oxidation kinetic curves obtained at different temperatures followed the parabolic law, and the weight gain per unit at 1,000°C was significantly higher than that at 800 and 900°C. The oxidation rate at 1,000°C was about three times faster than that at 800 and 900°C. Continuous and compact multicomponent oxide films mainly composed of Cr_2O_3, Al_2O_3, spinel $MnFe_2O_4$, and $MnCr_2O_4$ were obtained at 800 and 900°C. The oxide film started delaminating at 1,000°C; the outer layer was composed of Cr_2O_3, spinel $MnCr_2O_4$, and $MnFe_2O_4$, the middle layer was composed of Fe_2O_3 and Fe-Cr matrix, and the inner layer was composed of Al_2O_3 and SiO_2. Oxidation resistance at 1,000°C was reduced mainly because of porous Fe_2O_3 and inner oxidation of Al and Si. In addition, the oxidation mechanism was discussed based on kinetic and morphological observations.

Key words： ferritic heat-resistant stainless steel; high temperature oxidation; oxidation kinetics; oxidation mechanism

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