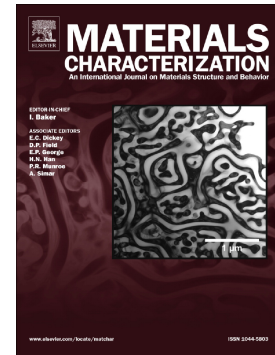


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High Temperature Oxidation Behavior of a High Al-containing Ferritic Heat-resistant Stainless Steel

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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 Cr₂O₃, Al₂O₃, spinel MnFe₂O₄, and MnCr₂O₄ were obtained at 800 and 900°C. The oxide film started delaminating at 1,000°C; the outer layer was composed of Cr₂O₃, spinel MnCr₂O₄, and MnFe₂O₄, the middle layer was composed of Fe₂O₃ and Fe-Cr matrix, and the inner layer was composed of Al₂O₃ and SiO₂. Oxidation resistance at 1,000°C was reduced mainly because of porous Fe₂O₃ 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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