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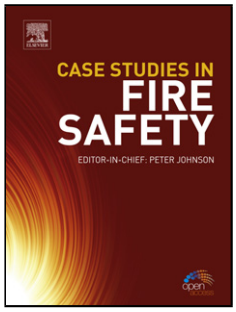


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# High-temperature oxidation of sintered austenitic stainless steel containing boron or yttria

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**Abstract**

The present study examines the cyclic oxidation behaviour at 900°C in air of sintered 316L austenitic stainless steels containing 1 wt.% yttria or 0.6 wt.% boron. The microstructures of the sintered and oxidized samples were characterised by field emission scanning electron microscopy (FESEM), energy dispersive X-ray spectroscopy (EDS) and X-ray diffraction (XRD) analyses. The two-dimensional image analyses of the pore amount, size and shape was correlated with the oxidation rate. The oxidation resistance of the sintered materials is influenced not only by the porosity characteristics but also by the capability of the alloy element or compound to form a more protective oxide scale. For the conditions chosen in this study, the boron-containing steel was found to provide a strong improvement in the high-temperature cyclic oxidation, which appears to be related to both the high densification favoured by the eutectic reaction and the presence of an iron borate. For the yttria-containing steel, the effect of porosity on oxidation rate was suppressed by the presence of oxides containing yttria and chromium.

*Keywords:* Austenitic stainless steel, boron, yttria, cyclic oxidation

## 1. Introduction

Powder metallurgy (P/M) stainless steels have been used in several technological applications in the food processing, chemical, aerospace and medical industries. It has also been used to manufacture automotive parts such as exhaust system components (flanges and sensors), antilock brake systems (ABS) sensors rings, turbocompressors and other systems exposed to high-temperature corrosive environments [1, 2]. P/M stainless steels have been used in place of some ferrous alloy powders due to their superior behaviour in corrosive

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