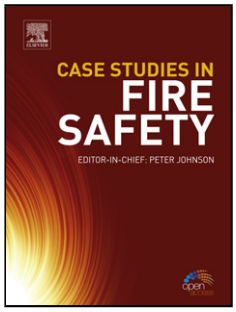

Title: Behaviour of a silicon-rich coating on Ti-46Al-8Ta (at. %) in hot-corrosion environments

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Title: Behaviour of a silicon-rich coating on Ti-46Al-8Ta (at. %) in hot-corrosion environments

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Highlights

- Adherent silicide coating was deposited on Ti-46Al-8Ta alloy in two-step process.
- Cyclic oxidation tests with different salt deposits were conducted.
- Silicon-rich coating had beneficial effect on oxidation resistance.
- Diffusion of reactive gases to substrate was prevented.

Abstract

In this work silicon-rich coating was deposited on a Ti-46Al-8Ta (at. %) alloy in a two-step procedure comprising physical and chemical vapour deposition (magnetron sputtering and pack cementation, respectively). Protective properties of the coating were tested through cyclic oxidation in air at 800 ^{o}C with samples contaminated with NaCl, Na_2SO_4 or a mixture of these two salts. The coated samples exhibited better hot corrosion resistance compared with the uncoated reference. This was attributed to the formation of an oxide layer composed of amorphous silica with embedded rutile and α cristobalite crystals, constituting a barrier against oxygen penetration.

Keywords: A. Intermetallics, B. SEM, Thermal cycling, C. Hot corrosion

1. Introduction

Titanium alloys and titanium aluminides have been under investigation for at least twenty years owing to the advantageous combination of physical, mechanical and chemical properties. Intermetallic phases in the Ti-Al binary system attract attention because of relatively low density, very high specific strength and oxidation resistance at moderate temperatures [1-4]. A lot of work has been devoted to improve mechanical properties and oxidation resistance of titanium alloys at elevated temperatures. Particularly good results were obtained by alloying with Nb, Mo, Ta, Si or W [5]. Alloys with high percentage of aluminium (up to about 45 at. %) and ternary additions of Nb and/or Ta are among the most advanced intermetallic materials with good oxidation resistance [6-9]. This can be further improved by surface engineering. A great