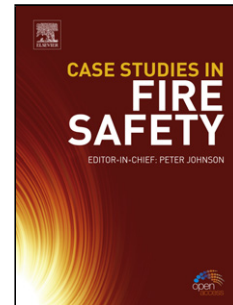


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Steam Oxidation of Aluminide Coatings under High Pressure and for Long Exposures

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Highlights

- Steam oxidation tests were carried out on aluminised P92 steels for 5000 and 10000 hours, at 650°C.
- After 5000 hours at 650°C and under 1 bar, a thin protective oxide scale composed of α -Al₂O₃ was formed. The entire surface of the sample was covered by whiskers.
- The oxide morphology was completely different after 5000 hours under 300 bar and at 650°C, with the appearance of large platelets.
- α -Al₂O₃ was also created after 5000 hours under high pressure but some traces of Fe appeared in clusters in some parts of the oxide layer.
- After 10000 hours of exposure under high pressure, the protective alumina was still present but Fe₂O₃ and Fe-Al spinels were revealed by Raman spectroscopy.
- The pressure seemed to enhance the outward diffusion of Fe through the oxide scale.
- The initial tensile cracks of the coatings propagated over time and by increasing the pressure but they appeared self-healed by α -Al₂O₃.
- The Al content revealed at the surface of the coatings after 10000h under 300 bar appeared sufficient to maintain the protective oxide scale.

Abstract. B2-FeAl-based aluminide coatings were elaborated on P92 ferritic-martensitic steels by slurry. A thin protective α -Al₂O₃ oxide layer was stable until 5000 h at 650 °C under flowing steam at 1 bar. At 300 bar and stagnant steam conditions, the morphology of α -Al₂O₃ changed markedly. Iron oxide clusters started to appear at the surface of the scale after 5000 h of exposure and kept on growing till 10000 h. It appears that pressure increased the outward diffusion of Fe through the coating and through the oxide scale and fostered the propagation of the tensile cracks of the coating.

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