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Influence of water vapour on the HfO₂ distribution within the oxide layer on CoNiCrAlHf alloys

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ABSTRACT

Cyclic oxidation behaviour of CoNiCrAl alloys doped by Hf in air and in air plus water vapour at 1050 °C was investigated using scanning electron microscopy (SEM) and X-ray diffraction (XRD). The results revealed that water vapour has a significant effect on the distribution of HfO₂ within the oxide layer. A HfO₂ rich layer formed within the oxide layer on the alloys after oxidation in the air plus water vapour. Additionally, cyclic oxidation in air plus water vapour led to a lower oxide scale growth rate than in air, and the adhesive property of alumina in the water vapour containing air environment was better than that in lab air. Voids and cracks formed within the oxide layer after oxidation for 600 h in air because of the nonuniform HfO₂ distribution at the oxide/alloy interface.

Keywords

High-temperature alloys; oxidation; scanning electron microscopy (SEM); X-ray diffraction (XRD)

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