Influence of Preoxidation on High-Temperature Corrosion of a FeCrAl Alloy Under Conditions Relevant to Biomass Firing

Preoxidation of a commercial FeCrAl alloy (Kanthal APM) was evaluated as a surface modification approach to reduce alkali chloride-induced corrosion during biomass firing in power plants. Samples of the alloy preoxidized at 900 °C in O₂ or O₂ + 10 vol% H₂O, and at 1100 °C in O₂, were coated with KCl and exposed at 560 °C to a gas mixture comprising of 12 vol% CO₂, 6 vol% O₂, 3 vol% H₂O, 400 ppmv HCl and 60 ppmv SO₂. The oxide formed at 1100 °C showed no reactivity with the corrosive species. By contrast, all samples preoxidized at 900 °C suffered severe attack, resulting in formation of Fe-, Cr- and Al-containing corrosion products in a heterogeneous morphology, similar to non-preoxidized samples. The observed differences with respect to the degree of corrosion attack on the preoxidized samples are discussed in terms of the composition and thickness of the different types of Al₂O₃ layers obtained by the preoxidation treatment.