Pre-oxidation and its effect on reducing high-temperature corrosion of superheater tubes during biomass firing

Pre-oxidation and its effect on reducing high-temperature corrosion of superheater tubes during biomass firing

Superheater tubes in biomass-fired power plants experience high corrosion rates due to condensation of corrosive alkali chloride-rich deposits. To explore the possibility of reducing the corrosion attack by the formation of an initial protective oxide layer, the corrosion resistance of pre-oxidised Al and Ti-containing alloys (Kanthal APM and Nimonic 80A, respectively) was investigated under laboratory conditions mimicking biomass firing. The alloys were pre-oxidised at 900°C for 1 week. Afterwards, pre-oxidised samples, and virgin non-pre-oxidised samples as reference, were coated with a synthetic deposit of KCl and exposed at 560°C for 1 week to a gas mixture typical of biomass firing. Results show that pre-oxidation could hinder the corrosion attack; however, the relative success was different for the two alloys. While corrosion attack was observed on the pre-oxidised Kanthal APM, the pre-oxidised Nimonic 80A remained unaffected suggesting protection of the alloy from the corrosive environment.