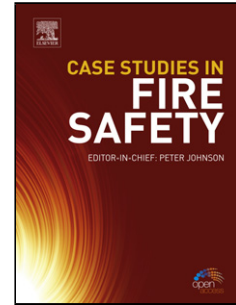


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Mechanism of metal dusting corrosion by pitting of a chromia-forming alloy at atmospheric pressure and low gas velocity

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Highlights

Pits formed during metal dusting corrosion are made of successive corrosion rings.

Internal oxidation of carbides controls pit nucleation and lateral growth kinetics.

Cooling can induce a crack through the internal oxidation layer.

The lack of gas renewal in cracks induces graphitisation of the carburised alloy.

Graphitisation provokes a localised inward growth, forming deep corrosion rings.

Abstract

FeNiCr samples (800HT) were exposed at 570 °C, 1 bar to a 47.25CO-47.25H₂-5.5H₂O atmosphere ($a_c=33$) flowing at 18 $\mu\text{m/s}$. Pitting corrosion was observed. Pits showed a flattened morphology and a constant pit diameter growth rate. Corrosion rings appeared successively at the surface during pit growth. A four-step mechanism is proposed which includes internal oxidation of carbides, graphitisation and localised enhanced graphitisation. Gas velocity and thermal cycling play key roles in pit morphology. Thermal cycling induces circular cracks. Low gas velocity induces the gas to evolve in crevices, due to local oxygen consumption.

Keywords

A. Steel; C. High temperature corrosion; C. Carburization; C. Internal oxidation

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