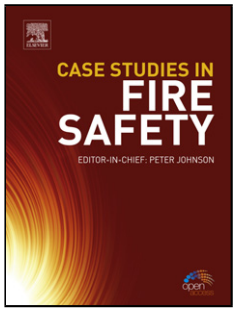


Title: Mechanism of metal dusting corrosion by pitting of a chromia-forming alloy at atmospheric pressure and low gas velocity

Author: Aurélien Fabas Daniel Monceau Claudie Josse Pascal Lamesle Aurélie Rouaix-Vande Put

PII: S0010-938X(16)30076-2
DOI: http://dx.doi.org/doi:10.1016/j.corsci.2016.02.033
Reference: CS 6670

To appear in:

Received date: 27-1-2016
Accepted date: 21-2-2016

Please cite this article as: Aurélien Fabas, Daniel Monceau, Claudie Josse, Pascal Lamesle, Aurélie Rouaix-Vande Put, Mechanism of metal dusting corrosion by pitting of a chromia-forming alloy at atmospheric pressure and low gas velocity, Corrosion Science http://dx.doi.org/10.1016/j.corsci.2016.02.033

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

Aurélien Fabas[1], Daniel Monceau[1], Claudie Josse[2], Pascal Lamesle[3], Aurélie Rouaix-Vande Put[1]

[1]*Institut Carnot CIRIMAT, Université de Toulouse, INPT-ENSIACET, 4 allée Emile Monso, BP-44362, 31030 Toulouse Cedex 4, France*

[2] *UMS Castaing, Université de Toulouse, ECA, 3 rue Caroline Aigle,, 31400 Toulouse, France*

[3] *ICA (Institut Clément Ader), Université de Toulouse, Mines Albi, INSA, ISAE, UPS, Campus Jarlard, F-81013 Albi cedex 09, France*

## 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-47.25$H_2$-5.5$H_2O$ atmosphere ($a_C$=33) flowing at 18 µm/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