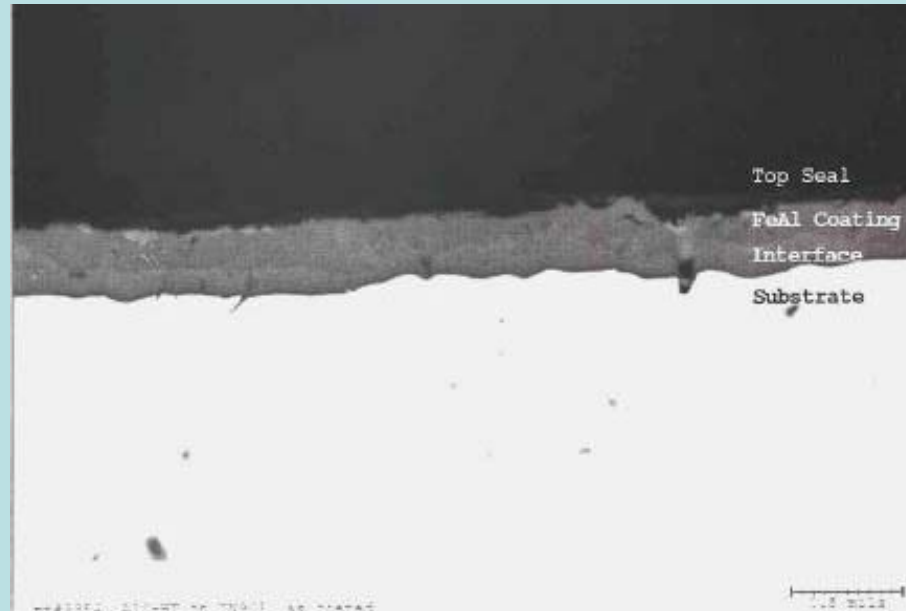


EVALUATION OF ALUMINIDE COATINGS ON DISCOLORED TURBINE PARTS

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INTRODUCTION

- Black discoloration was first discovered
 - Semi-finished Nozzle Support Rings
 - Taurus 70
 - Titan 130



Semi-finished nozzle support ring

INTRODUCTION

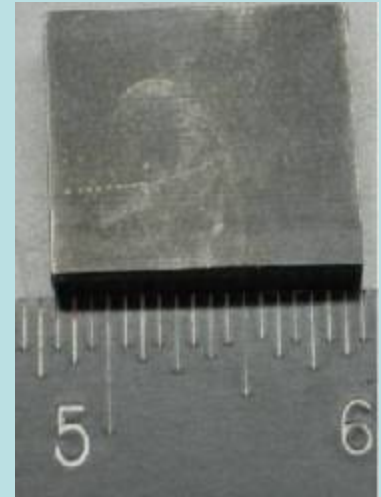
- Parts
 - Made from IN903
 - Coated with a simple aluminide coating
- Discoloration
 - Difficult to remove prior to coating
 - Believed to affect adhesion of the simple aluminide coating



Discoloration of Semi-finished nozzle support ring

PROJECT MATERIALS

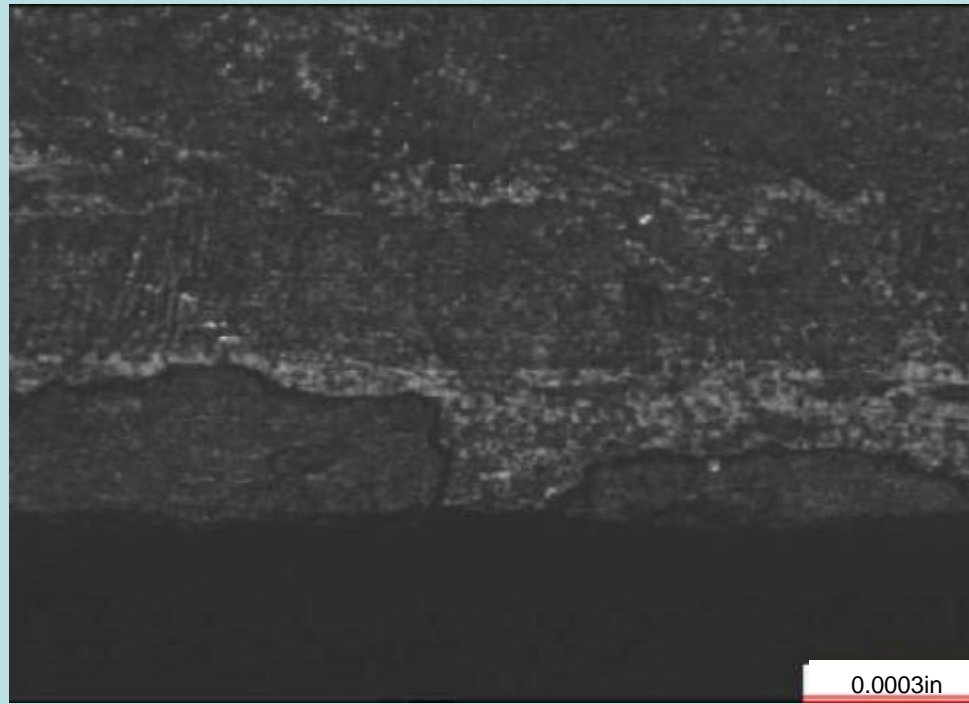
- No nozzle support ring available
 - Destructive testing
- Semi-finished Mars nozzle case
 - Made of 903 Alloy
 - Without an aluminide coating
 - Observed to have the discoloration
- Section of the nozzle case
 - cut into one inch squares for testing



Square test sample

PROJECT GOALS

- Inspect the composition of black discoloration
- Evaluate ways to remove it



200X magnitude of Mars nozzle case discoloration

ANALYSIS OF DISCOLORATION

- Mars nozzle case
 - Thickness
 - Taken nondestructively by magnetic induction
 - Chemical composition of the discoloration
 - Scanning Electron Microscope (SEM)



Scanning Electron Microscope

TESTING OF DISCOLORATION

Mars nozzle case

- Test samples were shipped to a supplier
 - Cleaned
 - Grit-blasting
 - Coated
 - Simple aluminide coating

RESULTS OF DISCOLORATION

- Supplier was able to completely remove discoloration
 - Using standard grit blasting
- Light grit-blasting only removed part of it
 - As it is seen under the aluminide coating
 - On the third and fourth samples
- Last sample was not grit-blasted



Test samples of Mars nozzle case

RESULTS OF DISCOLORATION

- But the discoloration on the nozzle support rings could not completely be removed by standard grit-blasting
- The discoloration on the nozzle case is believed to be a different oxidation from the original support rings

NEW SAMPLE

- After the analysis had been completed on the test samples of the nozzle case, a Titan 130 nozzle support ring with black discoloration under the simple aluminide coating became available for destructive testing



Titan 130 nozzle support ring

PROJECT GOALS FOR TITAN 130

- Determine the composition of black discoloration
- Removal Methods



Section of Titan 130 nozzle support ring

ANALYSIS OF TITAN 130

- Test coupons
 - Were made of the nozzle ring support
- Some of the samples will be sectioned and mounted to inspect the microstructure and composition of the coating with the discoloration beneath it

CONCLUSIONS

- Discoloration on the Mars nozzle case was found to not be representative of the original discoloration on the nozzle support ring.
- Discoloration of Titan 130 nozzle support ring is still being analyzed to find composition, microstructure and thickness

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QUESTIONS

