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Evaluation of Zerust Film for Customer

To: Curt Hill

For: Customer

From: Cortec Laboratories, Inc.
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cc: Boris Miksic
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Project #: 18-247-1125.bis

Results reported by:

Brian Benduha
Lab Technician

Approved by:

Robert T. Kean, Ph.D.
Laboratory Manager



Background: Customer manufactures and supplies metal powder precision components for automotive, industrial, and consumer markets in the United States and internationally. They currently have Zerust as their preferred national supplier, but are looking for Cortec to assist them in solving their North American rust issues.

Customer's facility, located in Pennsylvania, ships parts and materials to a precision grinder located in South Carolina. However, they are receiving some of the parts with rust. So, they are asking Cortec to test the Zerust VCI bag supplied by customer to see if it has any VCI chemistry. These VCI bags were new to the process when the rust started to occur, so they want to see if there is any correlation.

Sample Received: Blue Zerust VCI bags, 14" x 10" x 19", 2mils, received on 12/27/18 in good condition.

Method: FTIR Analysis, CC-006
Razor Blade Test, CC-004*
NACE Standard VIA Test, TM0208-2008, item No. 21253*
Nitrite/Nitrate Test*
*The tests marked are not covered under Cortec Laboratories, Inc. ISO 17025 Scope of Accreditation

Materials: VIA test kit (testing jars w/lids, steel plugs, 400grit sandpaper)
Carbon Steel panels, SAE 1010 (for razor blade testing)
Copper panels (for razor blade testing)
Glycerol (lot #Q10A018)
Nitrite/Nitrate Test Strips (lot #HC719626)
Methanol, ACS grade (lot #18F066507)
VpCI-126 film, 4mil (batch #510220)

Procedure: For VIA testing, the procedure was followed according to NACE VIA Test, TM0208-2008 option 2 (option 2 uses machine-aided grinding and polishing for the steel plugs).

Note- the VIA tests were conducted using two strips of sample per jar (1" X 6" per strip)

The FTIR analysis and razor blade testing was followed according to standard procedure.

Results: The following results were found:

Nitrite/Nitrate Test Strips

Sample	Results
Zerust VCI film	Does not contain any nitrite/nitrate

Results:

The following results were found:

Razor Blade Test- Carbon Steel Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Zerust VCI film	Pass	Pass	Pass	Pass
VpCI-126 film	Pass	Pass	Pass	Pass
Control	Fail	-	-	Fail

Razor Blade Test- Copper Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Zerust VCI film	Fail	Fail	Fail	Fail
VpCI-126 film	Pass	Pass	Pass	Pass
Control	Fail	-	-	Fail

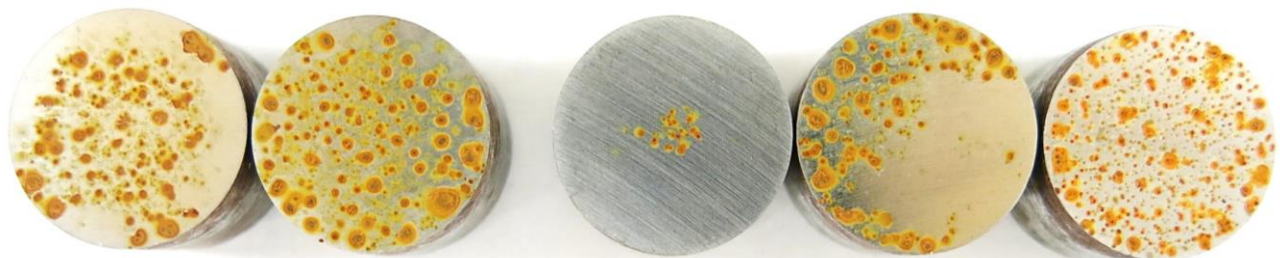
NACE VIA Test

Sample	Plug #1	Plug #2	Plug #3	End Result
Zerust VCI film	Grade 2	Grade 1	Grade 0	Fail
VpCI-126 Film*	Grade 3	Grade 3	Grade 2	Pass
Control	Grade 0	Grade 0	-	Fail

*Note- The results for VpCI-126 film used in this report was previously tested (from 16-083-1125)

Photo from the NACE VIA test:

Zerust VCI film



Control #1

Control #2

Plug#1

Plug #2

Plug #3

VpCI-126 film



Control #1

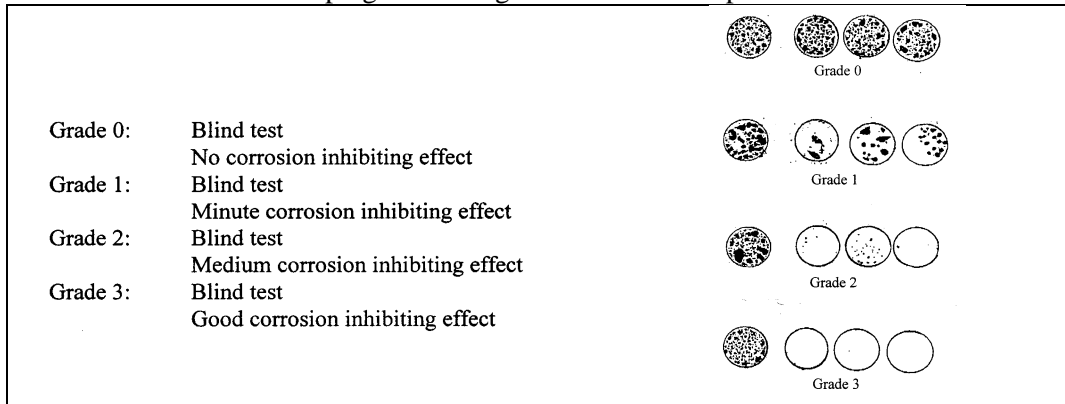
Control #2

Plug#1

Plug #2

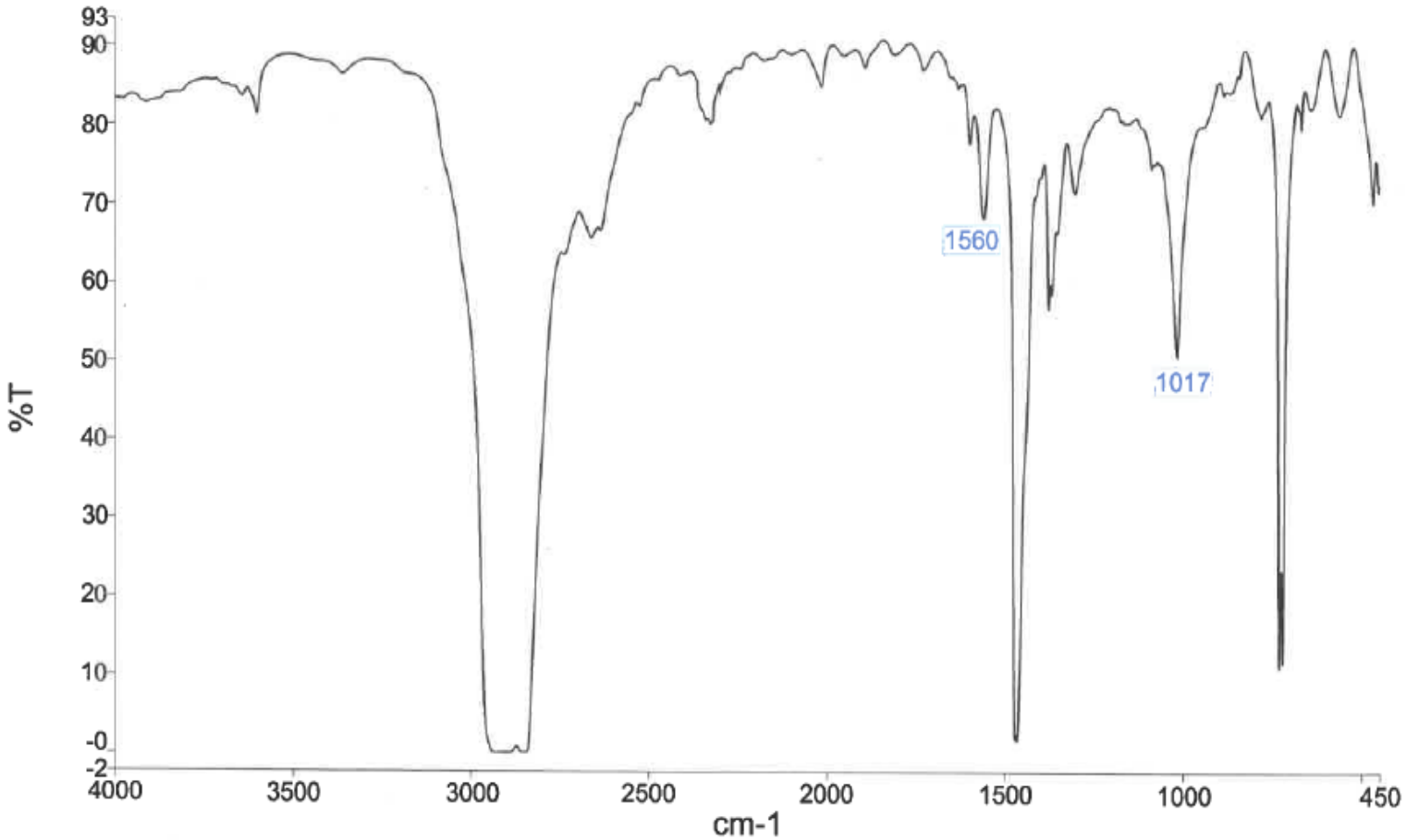
Plug #3

VIA Test Grades (Grade 2 or 3 are passing)
 All three plugs must be grade 2 or better to pass the test



FTIR Analysis:

Zerust VCI film



Zerust film, 18-247-1125 Sample 038 By Brian Date Thursday, January 10 2019

Interpretations:

Based on the FTIR analysis, the Zerust film supplied by customer appears to contain carboxylate type corrosion inhibitors based on the peak observed in the 1500-1850 cm^{-1} region of the spectrum. This film also appears to contain desiccant, based on peak observed in the 1000-1200 cm^{-1} region of the spectrum. However, based on the results of the corrosion testing, this film does not contain sufficient vapor phase corrosion inhibitor to pass the VIA test. Furthermore, the results from the razor blade test shows that the Zerust film provides contact corrosion protection for carbon steel, but not for copper.

VpCI-126 film would be a better alternative to the Zerust film since it provides excellent vapor phase corrosion protection as well as multi-metal contact corrosion protection.