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AGS AMERICAN GLOBAL STANDARDS

Evaluation of Orvic Film and Lord Film Compared to VpCI-126 Film

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Project #: 19-199-1125.bis

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ISO 9001 QUALITY SYSTEM REGISTERED

ENVIRONMENTAL ISO 14001 CERTIFIED SYSTEM REGISTERED

Background: Two films, Lord and Orvic, have been submitted for corrosion testing compared to VpCI-126 film.

Samples Received: The following samples were received on 10-2-19 in poor (dirty) condition:

1. Blue Lord film bag, 4mils
2. Blue Orvic film bag, 2mils

Method:
NACE Standard VIA Test, TM 0208-2018
FTIR Analysis, CC-006
Razor Blade Test, CC-004*
Nitrite/Nitrate Test*
*The tests marked are not covered under Cortec Laboratories, Inc. ISO 17025 Scope of Accreditation

Materials:
VpCI-126 film, 4mil (batch #510220)
VIA test kit (testing jars with lid apparatus, steel plugs, 400grit sandpaper)
Steel panels, SAE 1008/1010 (Q-Panel, S-35 DG, 3"x5"x0.032")
Copper panels
Glycerol (lot #W20E023)
Nitrite/Nitrate Test Strips (lot #HC719626)
Methanol, ACS grade (lot #18F066507)

Procedure: For VIA testing, the procedure was followed according to the NACE VIA Test, TM0208-2018 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 razor blade testing was followed according to standard procedure.

Results: The following results were found:

Razor Blade Test- Steel Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Lord Film	Fail	Fail	Fail	Fail
Orvic Film	Fail	Fail	Fail	Fail
VpCI-126 Film*	Pass	Pass	Pass	Pass
Control	Fail	-	-	Fail

Razor Blade Test- Copper Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Lord Film	Fail	Fail	Fail	Fail
Orvic Film	Fail	Fail	Fail	Fail
VpCI-126 Film*	Pass	Pass	Pass	Pass
Control	Fail	-	-	Fail

***Note- The razor blade for VpCI-126 film were previously tested (from 16-083-1125)**

Results: The following results were found:

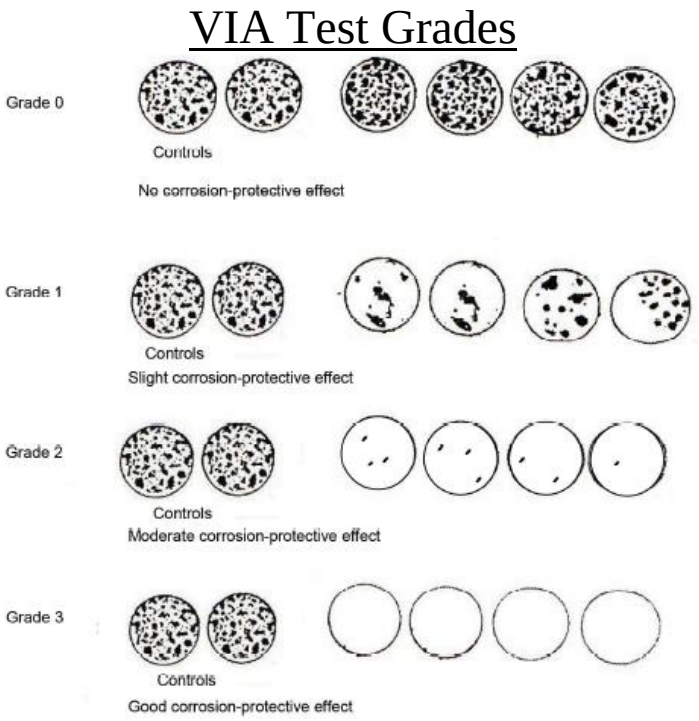
NACE VIA Test

Sample	Plug #1	Plug #2	Plug #3
Lord Film	Grade 0	Grade 0	Grade 0
Orvic Film	Grade 0	Grade 0	Grade 0
VpCI-126 Film*	Grade 3	Grade 3	Grade 2
Control	Grade 0	-	-

***Note- The VIA results for VpCI-126 film were previously tested (from 16-083-1125)**

Nitrite/Nitrate Test Strips

Sample	Results
Lord Film	Does not contain any nitrite/nitrate
Orvic Film	Does not contain any nitrite/nitrate

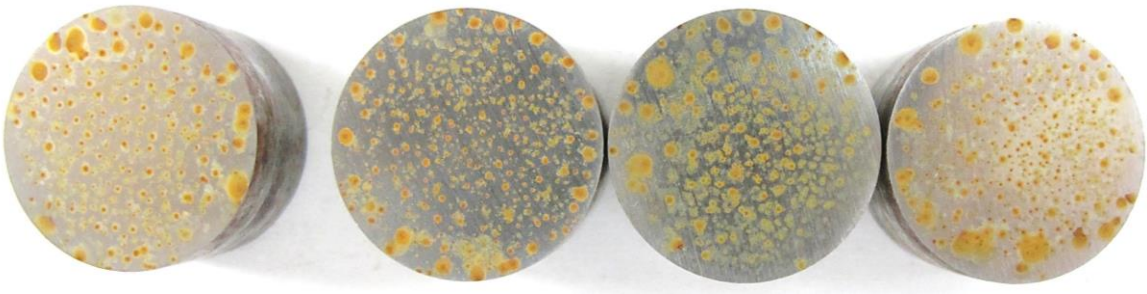


Photos from the NACE VIA test:

Lord Film

Control Plug#1 Plug #2 Plug #3

Orvic Film



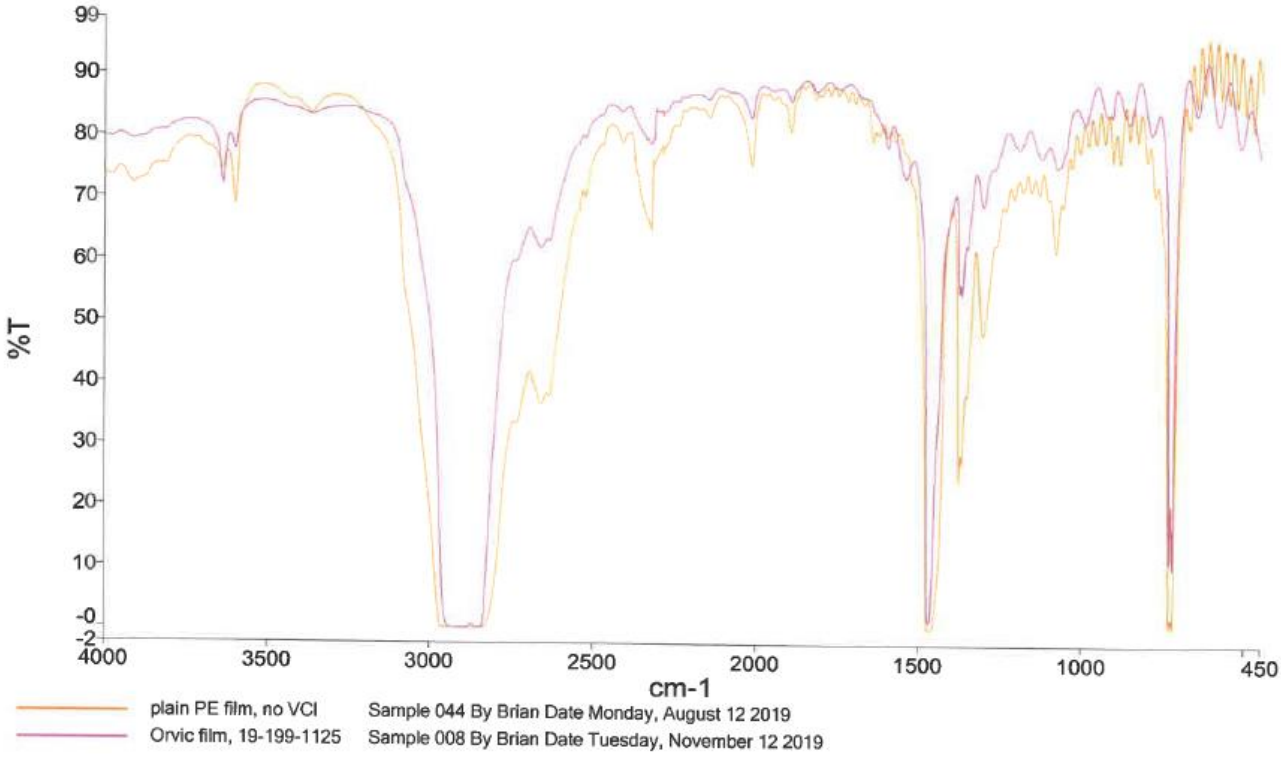
Control Plug#1 Plug #2 Plug #3

VpCI-126 film

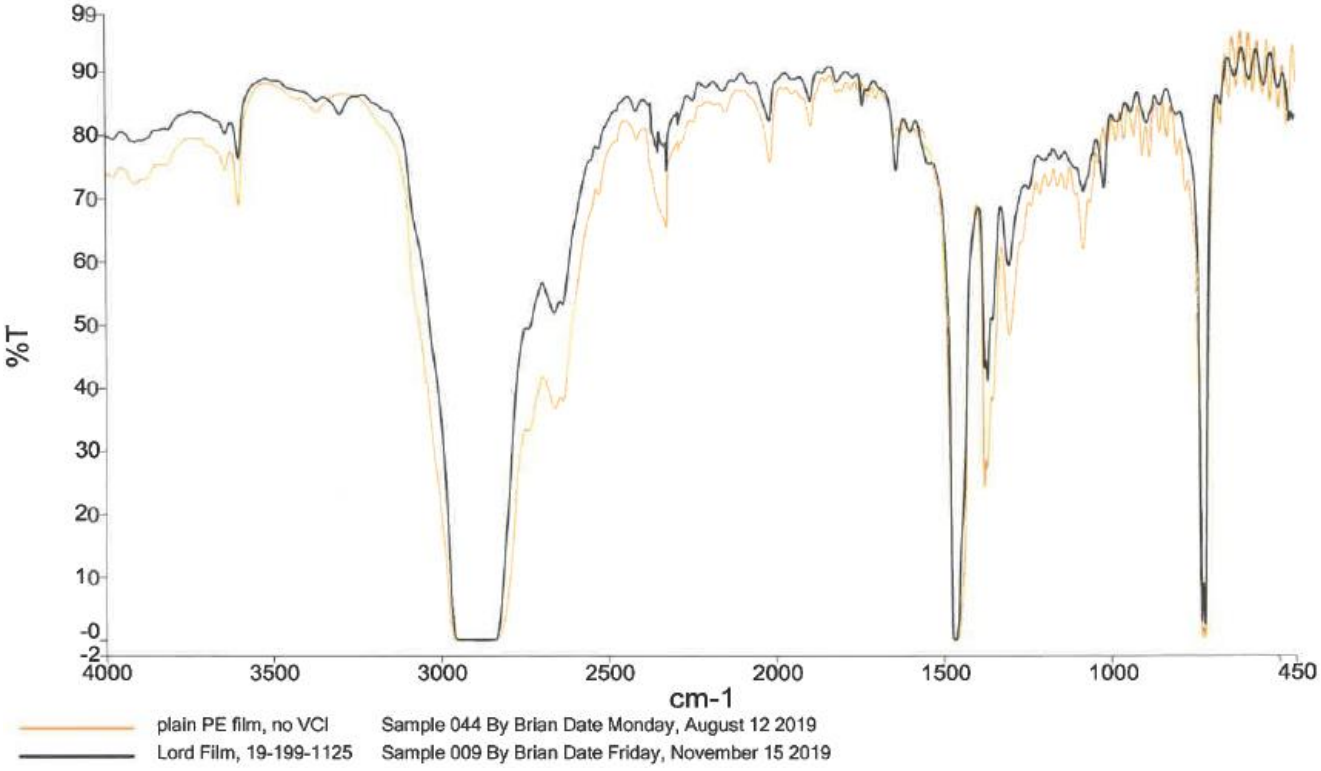
Control Plug#1 Plug #2 Plug #3

FTIR Analysis:

Orvic film compared to plain polyethylene film



Lord film compared to plain polyethylene film



Interpretations: The Lord and Orvic films do not appear to contain any corrosion inhibitor based on the FTIR analysis. The results of the VIA and razor blade testing also show that these films do not provide any corrosion protection in the contact or vapor phase. VpCI-126 film, however, provides excellent contact and vapor phase corrosion protection.