CORTEC Laboratories

4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone: (651) 429-1100, Fax: (651) 429-1122
Toll Free: (800) 4-CORTEC, E-mail: info@cortecvci.com
cortecvci.com • corteclaboratories.com

Testing of Films

To: Mike Gabor

From: Cortec Corporation Laboratories
4119 White Bear Parkway
St. Paul, MN 55110

cc: Boris Miksic
Cliff Cracauer

Project #: 13-054-1125

Results reported by: Brian Benduha
Brian Benduha
Lab Technician

Approved by:
Margarita Kharshan
Laboratory Director

Date: April 3, 2013

Purpose: To test and compare the five submitted VCI films. The manufacturer of the films might be Grofit Plastic (VCI 2000).

Sample Received:
1) Light Blue Film, 3mils
2) Dark Blue Film, 3.5mils
3) Green Film, 1.5mils
4) Light Yellow Film, 2mils
5) Dark Yellow Film, 1.5mils

Method:
1) VIA Test CC-027
2) Razor Blade Test CC-004*
3) FTIR analysis

*Cortec Laboratory is not accredited for the test marked

Materials:
1) VIA test kit
2) Razor blade test kit
3) Mil thickness gauge
4) Paragon 1000 FTIR
5) Clear non-VCI film, 3mils

Procedure: The tests were conducted according to standard procedures for each test.

Results:

Razor Blade Test- Carbon Steel

Sample	Panel #1	Panel #2	Panel #3	End Result
Light Blue Film	Fail	Fail	Fail	Fail
Dark Blue Film	Fail	Fail	Fail	Fail
Light Yellow Film	Fail	Fail	Fail	Fail
Dark Yellow Film	Fail	Fail	Fail	Fail
Green Film	Fail	Fail	Fail	Fail
Control	Fail	-	-	-

Razor Blade Test- Copper Panels

Sample	Panel #1	Panel #2	Panel #3	End Result
Light Blue Film	Fail	Fail	Fail	Fail
Dark Blue Film	Fail	Fail	Fail	Fail
Light Yellow Film	Fail	Fail	Fail	Fail
Dark Yellow Film	Fail	Fail	Fail	Fail
Green Film	Fail	Fail	Fail	Fail
Control	Fail	-	-	-

VIA Test

Sample	Plug #1	Plug #2	Plug #3	End Result
Light Blue Film	Grade 2	Grade 1	Grade 0	Fail
Dark Blue Film	Grade 1	Grade 1	Grade 0	Fail
Light Yellow Film	Grade 1	Grade 1	Grade 0	Fail
Dark Yellow Film	Grade 2	Grade 1	Grade 1	Fail
Green Film	Grade 2	Grade 1	Grade 0	Fail
Control	Grade 0	-	-	-

The VIA grading system is attached to the end of the report

Interpretations: All five of the submitted films failed the VIA and razor blade testing. Based on the FTIR results, the films contain an insufficient amount of salt of carboxylic acid, probable sodium benzoate. Dark blue film and dark yellow film probably additionally contain a small amount of desiccant. The acidic nature of desiccant prevents corrosion protection when the film is in contact with the metal, especially in the presence of condensation.

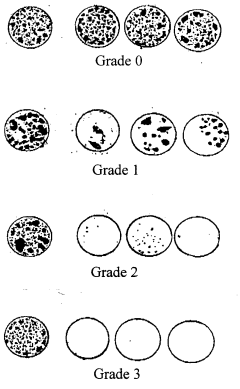
VIA Test Grades (Grade 2 or 3 are passing)
All three plugs must be of passing grade for the test to be considered a pass.

Grade 0: Blind test
No corrosion inhibiting effect

Grade 1: Blind test
Minute corrosion inhibiting effect

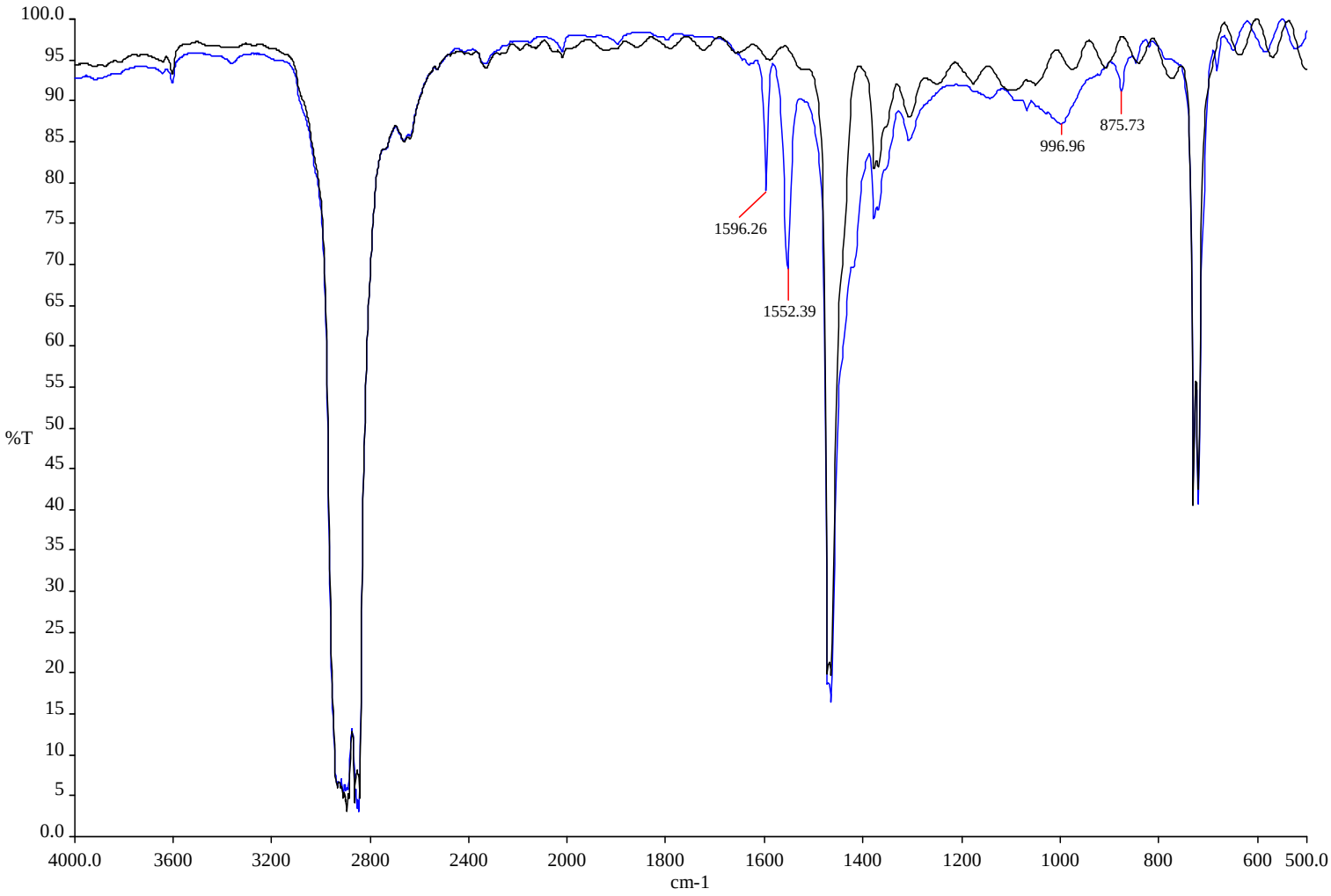
Grade 2: Blind test
Medium corrosion inhibiting effect

Grade 3: Blind test
Good corrosion inhibiting effect



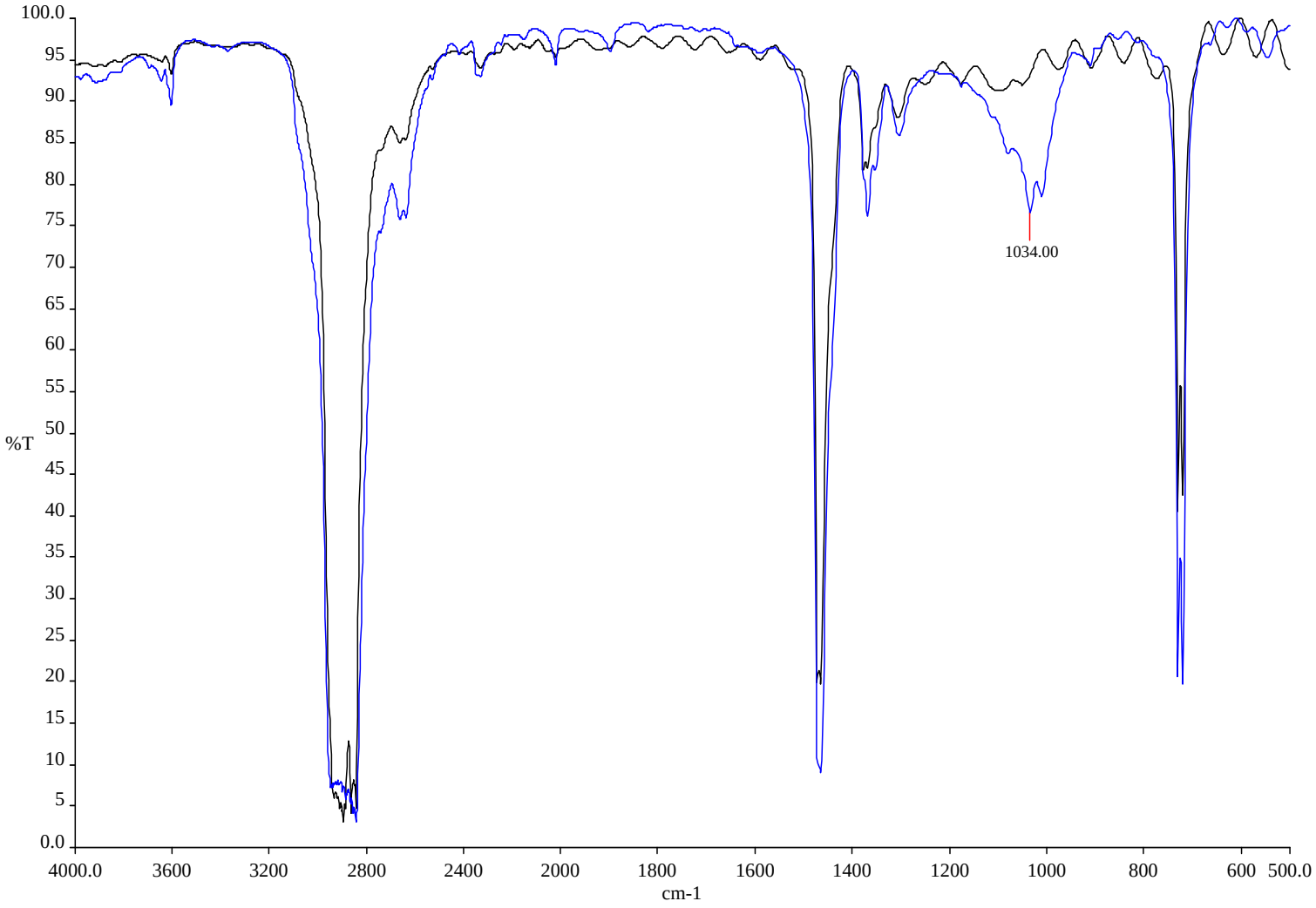
FTIR Analysis

Light Blue Film compared to clear non-vci film



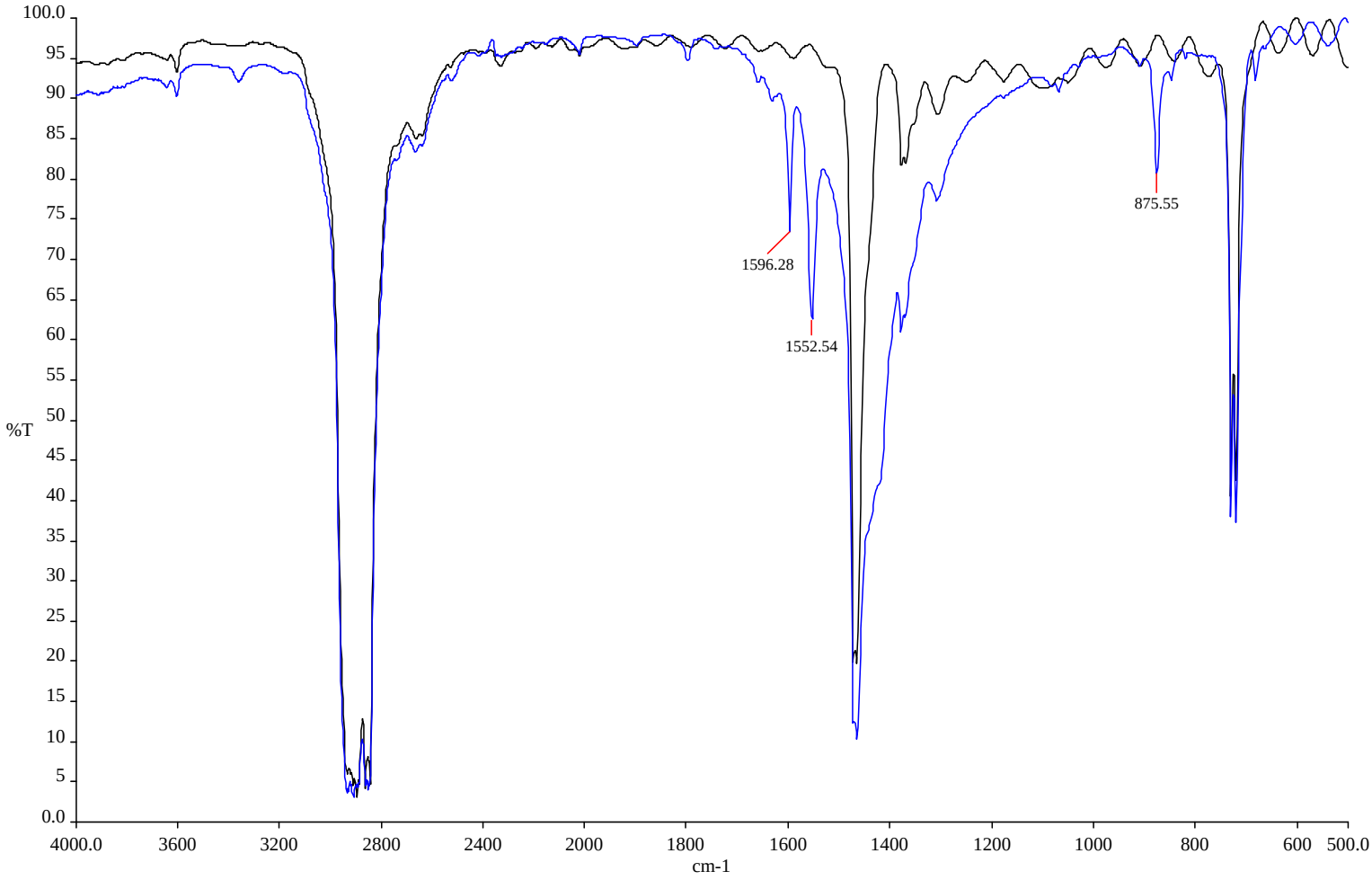
FTIR Analysis

Dark Blue Film compared to clear non-vci film



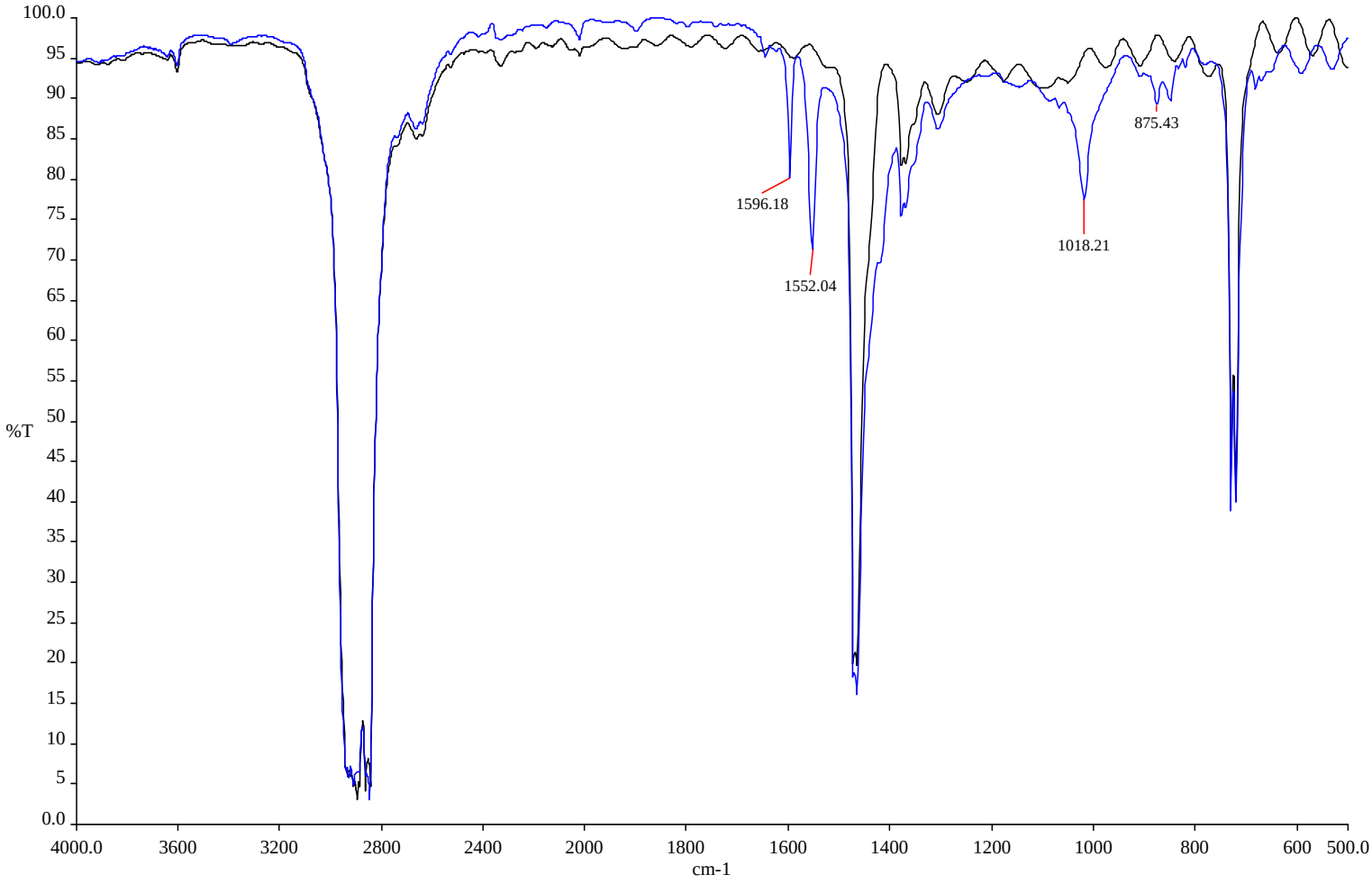
FTIR Analysis

Light Yellow Film compared to clear non-vci film



FTIR Analysis

Dark Yellow Film compared to clear non-vci film



FTIR Analysis

Green Film compared to clear non-vci film