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## *Evaluating Zerust Films Manufactured in Japan*

**Background:** Customer submitted samples of Zerust films that have been manufactured in Japan. They would like these films to be evaluated for their corrosion inhibiting performance.

**Purpose:** To evaluate the VCI performance of submitted films.

**Materials:** Zerust HOF Film for non-ferrous metals (pink)  
 Zerust ESD (clear)  
 Zerust ROF for multi-metal (coral)  
 Zerust MYF for ferrous metals (yellow)  
 Zerust Stat-3S ESD (blue)  
 Razorblade Test Kit  
 VIA Test Kit  
 EM Quant Nitrate/Nitrite Test Strips  
 Perkin Elmer Paragon 1000 FTIR Spectrometer

**Method:** Razorblade Test  
 VIA Test  
 Nitrite/Nitrate Test  
 FTIR Spectrometry  
 Surface Resistivity  
 Static Decay Rate

**Procedure:** All tests were carried out according to standard procedures.

### **Results:**

#### **Carbon Steel Razorblade Test Results**

Sample	Panel 1	Panel 2	Panel 3	Control
Zerust HOF	Fail	Fail	Fail	Fail
Zerust ESD	Fail	Fail	Fail	Fail
Zerust ROF	Fail	Fail	Fail	Fail
Zerust MYF	Pass	Pass	Pass	Fail
Zerust Stat-3S	Fail	Fail	Fail	Fail

### Copper Razorblade Test Results

Sample	Panel 1	Panel 2	Panel 3	Control
Zerust HOF	Fail	Fail	Fail	Fail
Zerust ESD	Fail	Fail	Fail	Fail
Zerust ROF	Fail	Fail	Fail	Fail
Zerust MYF	Fail	Fail	Fail	Fail
Zerust Stat-3S	Fail	Fail	Fail	Fail

### VIA Test Results

Sample	Plug 1	Plug 2	Plug 3	Control
Zerust HOF	Grade 2	Grade 1	Grade 1	Grade 0
Zerust ESD	Grade 0	Grade 1	Grade 1	Grade 0
Zerust ROF	Grade 3	Grade 2	Grade 2	Grade 0
Zerust MYF	Grade 2	Grade 1	Grade 2	Grade 0
Zerust Stat-3S	Grade 1	Grade 0	Grade 0	Grade 0

### Nitrite/Nitrate Test Results

Sample	NO <sub>2</sub> <sup>-</sup> /NO <sub>3</sub> <sup>-</sup>
Zerust HOF	-/-
Zerust ESD	-/-
Zerust ROF	+/+
Zerust MYF	+/+
Zerust Stat-3S	-/-

### ESD Test Results

Test	Zerust ESD	Zerust Stat-3S	Accepted Value
Surface Resistivity Inside Surface (Ω/sq)	3.1x10 <sup>12</sup>	8.1x10 <sup>12</sup>	1.0x10 <sup>5</sup> -1.0x10 <sup>12</sup>
Surface Resistivity Outside Surface (Ω/sq)	5.9x10 <sup>12</sup>	7.8x10 <sup>12</sup>	1.0x10 <sup>5</sup> -1.0x10 <sup>12</sup>
Static Decay Rate Inside Surface (s)	0.02	0.04	< 2.0
Static Decay Rate Outside Surface (s)	0.03	0.05	< 2.0

**Conclusion:**

- (1) Of the submitted films, only the Zerust MYF (yellow) film demonstrated contact phase corrosion protection for ferrous metals only.
- (2) Of the submitted films, only Zerust ROF (coral) provided vapor-phase corrosion inhibition as demonstrated in the VIA test results.
- (3) Zerust MYF and Zerust ROF are nitrite based films which was verified by the nitrite/nitrate test.
- (4) The submitted ESD films, blue Stat-3S and clear Zerust ESD, failed the surface resistivity test with values outside the accepted range; however, both of these films did meet the requirements for static decay rate.
- (5) The FTIR spectrum collected are attached.

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