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Evaluation of Zerust/Excor Masterbatch

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Background: A sample of Excor masterbatch was submitted for analysis. An evaluation of the chemical composition and corrosion inhibiting performance was requested.

Sample Received: Yellow masterbatch pellets

Method:

- 1) Film Extrusion
- 2) VIA Test Method, CC-027
- 3) Razor Blade Test Method, CC-004
- 4) Solvent Extraction
- 5) Fourier-Transform Infrared Spectroscopy (FTIR), CC-006
- 6) Gas Chromatography/Mass Spectrometry (GCMS)
- 7) Nitrate/Nitrite Test Method

Materials:

- 1) Submitted Masterbatch
- 2) *m*PE
- 3) LDPE
- 4) VIA Test Kit
- 5) Razor Blade Test Kit
- 6) Methanol
- 7) EM Quant Nitrate Test Strips

Procedure:

Part I. Evaluation of Masterbatch

The composition of the submitted masterbatch was analyzed through chemical characterization techniques. The submitted masterbatch pellets were subjected to solvent extraction in methanol and the resultant extract analyzed via FTIR and GCMS. The observed mass spectra were matched to an internal library. The masterbatch pellets were also extracted with water and analyzed for nitrates and nitrite content.

Part II. Evaluation of Extruded Film

Sample films were extruded with the submitted masterbatch in order to evaluate the corrosion inhibiting performance. The masterbatch was added to a blend of *m*PE and LDPE at a 12% let down ratio. Film was extruded at Cambridge Advanced Films on E6 at a 2.5:1 blow up ratio, 16" tube x 0.004". The resultant film was evaluated for its corrosion inhibiting performance with the VIA Test and Razor Blade Test methods.

Results:

Table 1. Razor Blade Test Results

Substrate	Panel 1	Panel 2	Panel 3	Control
Carbon Steel	Pass	Light Corrosion	Light Corrosion	Fail
Copper	Fail	Fail	Fail	Fail

Table 2. VIA Test Results

Plug 1	Plug 2	Plug 3	Control
Grade 3	Grade 2	Grade 2	Grade 0

Table 3. GCMS Results

Retention Time (min)	m/z Ratio	Chemical Identification	% Confidence
17.383	152	Methyl ester of hydroxy benzoic acid	90
17.631	165	Aromatic primary amide	50
18.229	220	Insoluble substituted phenol	98
24.731	225	Benzyltriazole derivative	96




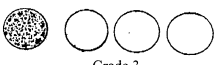
Table 4. Nitrate/Nitrite Test Results

Nitrate	Nitrite
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Interpretations:

- 1) The submitted masterbatch provides corrosion protection for ferrous metals but does not protect yellow metals as demonstrated in the VIA and Razor Blade tests.
- 2) The submitted masterbatch is not nitrite free contrary to the 2008 Excor patent.
- 3) The submitted masterbatch was found to contain the following chemicals: nitrites/nitrates, methyl ester of hydroxyl benzoic acid, insoluble substituted phenol, benzyltriazole derivative, and possibly primary amide. The GCMS and FTIR spectra are attached at the end of the report. These findings are consistent with Zerust/Excor patent literature.
(Note: The electronic copies of the mass spectral matches have faded due to poor color contrast, the originals have been filed and can be found with the lab report).

VIA Test Grades (Grade 2 or 3 are passing)

		
		Grade 0
Grade 0:	Blind test No corrosion inhibiting effect	
		Grade 1
Grade 1:	Blind test Minute corrosion inhibiting effect	
Grade 2:	Blind test Medium corrosion inhibiting effect	
		Grade 2
Grade 3:	Blind test Good corrosion inhibiting effect	
		Grade 3

