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## *Evaluation of Excor Emitter*

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**Project #:** 11-254-1125(bis)

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**Background:** An Excor emitter was submitted by customer for comparison testing with VpCI-111 emitters and VpCI-150 tape.

**Purpose:** To test the Excor emitter (picture 1) and compare the results with VpCI-111 and VpCI-150 tape.

**Samples Received:** 1 Excor Emitter

**Method:** Modified VIA test  
Analytical chemistry

**Materials:**

- 1) Carbon Steel Q-Panels, SAE 1010
- 2) 1-gallon size jars
- 3) VIA solution
- 4) Excor emitter
- 5) VpCI-111 emitter
- 6) VpCI-150 tape
- 7) GC spectrometer, Hewlett•Packard
- 8) Cortec's VpCI sensor

**Procedure:**

- I. The following procedure was followed for the Modified VIA Test:
  - 1) Prepare the carbon steel panels for cleaning by dipping them in methanol, and then drying with paper towels.
  - 2) Place the Excor emitter inside a one-gallon size jar, and hang the carbon steel panel from the lid. For VpCI-111, one emitter was used per jar. For VpCI-150, one piece of tape equaling 5 X 3/4 inches was used per jar.
  - 3) Seal the jars, and allow to condition for 24 hours at room temperature.
  - 4) After conditioning, add 30ml of VIA solution to the bottom of the jars.  
Note- VIA solution is 3% glycerin in DI water.
  - 5) Place the jars in a cycling oven, which cycles for 16 hours at 50°C, and 8 hours at room temperature. 24 hours constitutes one cycle.
  - 6) After 5 cycles of testing, the jars were taken out of the oven, and the panels were inspected for corrosion. (picture 2)
- II. GC was run according to standard procedure solvent-chloroform, GC grade.
- III. Cortec's VpCI sensor was used according to the following procedure:  
VpCI sensor strips are prepared by cutting filter paper into strips approximately 0.5" x 2.5".
  - 1) Place test specimen in the bottom of the jars.
  - 2) Dip VpCI sensor strip in the VpCI sensor test solution, leaving the top 1/2" of the strip dry. Attach the top of the strip to the inside of the jar lid (using scotch tape)
  - 3) Immediately screw the lid on tight and leave test set up sit until color change from blue to pink is observed. (picture 3)

**Results:** 1) The following results were found for the modified VIA test (after 5 cycles):

Product	Results*
Excor Emitter	Heavy corrosion
VpCI-111 emitter	No corrosion
VpCI-150 tape	No corrosion

\*See pictures for further detail

2) Analytical test results:

Based on the analytical test results Excor emitter contains BHT (Butylated Hydroxytoluene) antioxidant as a major ingredient. This product is primarily used as an additive in cosmetics, food, pharmaceuticals, rubbers, petroleum products to prevent their oxidation and is not active in vapor phase. The additional ingredients are benzotriazole and a minimum amount of benzoic acid. (probably from the amine/ammonium salt of benzoic acid)

3) VpCI sensor was used to register the presence of corrosion inhibitors in the vapor phase. Cortec VpCI-137 foam was used for comparison.

Time to color change from blue to pink (picture 3)

Excor Emitter – didn't change for 8 hours

VpCI-137 foam – changed in 1 hour from blue to pink

Control – didn't change

**Interpretations:** The results of the above tests indicate that the Excor emitter does not provide sufficient corrosion protection to carbon steel. This can be explained with:

1. limited amount of VpCI-based materials in the formulation
2. granular polymeric carrier used prevents VpCI to be released

**Pictures:**

**Picture 1:**

**Excor Emitter**



**Picture 2:**

**Modified VIA Test**  
after 5 cycles



Excor Emitter



VpCI-111 emitter



VpCI-150 Tape

Picture 3:

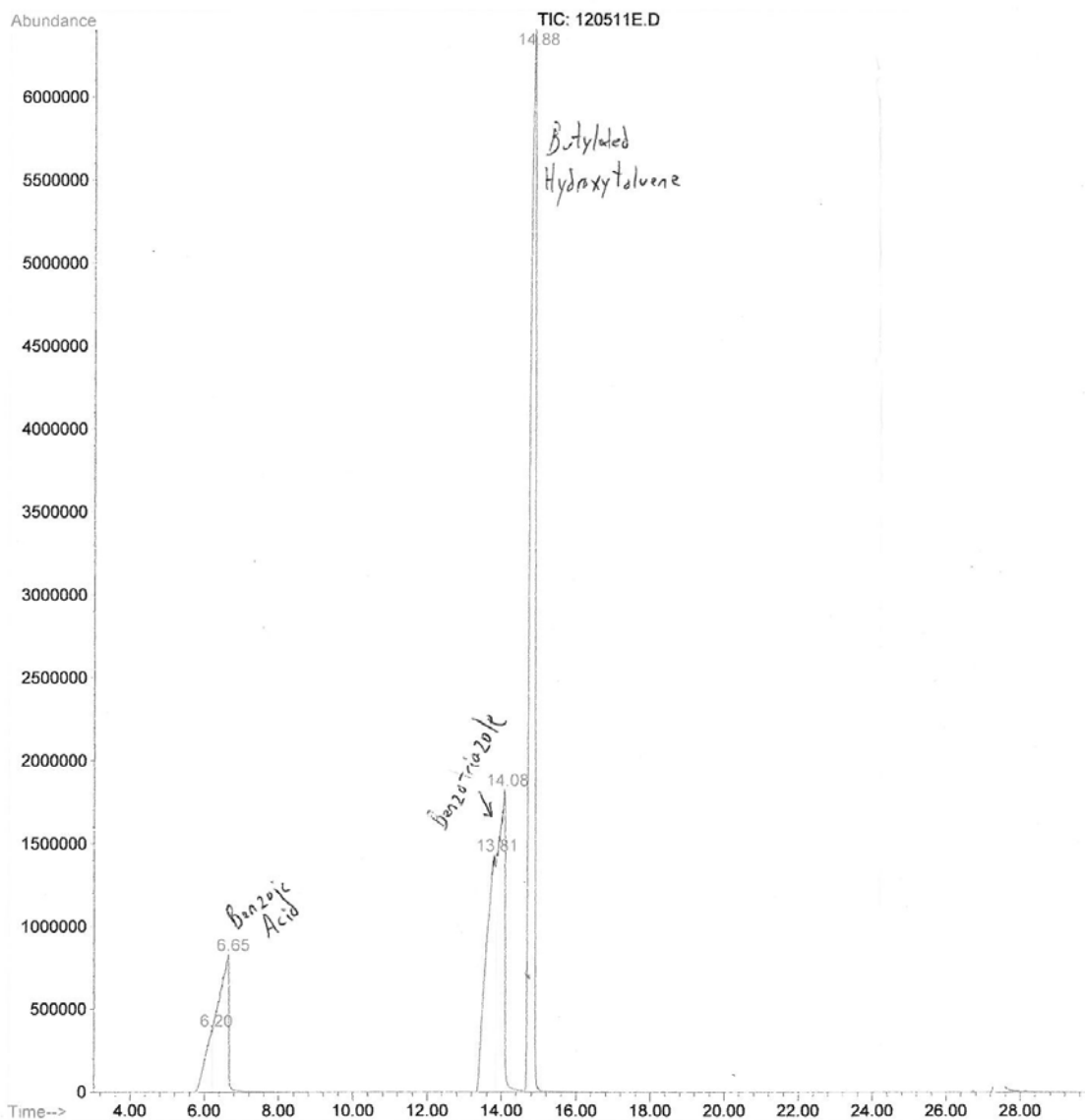


Area Percent Report

Data File : C:\HPCHEM\1\DATA\120511E.D  
Acq On : 5 Dec 2011 2:39 pm  
Sample : Excor Emitter in Chloroform  
Misc :

Vial: 28  
Operator: Brian  
Inst : GC/MS Ins  
Multiplr: 1.00  
Sample Amount: 0.00

MS Integration Params: events.e  
Method : C:\HPCHEM\1\METHODS\BTA1-3.M (Chemstation Integrator)  
Title :



120511E.D BTA1-3.M Mon Dec 05 15:09:16 2011