VAPPRO 5 and VAPPRO 10 Emitters

Magna Chemical Canada Inc.

Background: Two VAPPRO 5 emitters and one VAPPRO 10 emitter were submitted for evaluation of VCI contents and corrosion protection performance. Magna Chemical Canada Inc manufactures the emitters.

Purpose: Analyze the chemistry of the VCI content and ability of the emitters to provide corrosion protection.

Methods: TL-8135-002 (German VIA Test)

Gas Chromatography

pH Test

NO_2/NO_3 Test

Analytical Test

Materials: German VIA Test Kit

HP5890A Gas Chromatograph

HP5970 B Mass Selective Detector

pH Test Strips

NO_2/NO_3 Test Strips

Hydrochloric acid (concentrated)

Procedure: The above tests were performed according to the standard procedures for each. An extraction was made of each sample by dissolving 15% of the powder from inside of the emitter in separate beakers in de-ionized (DI) water. An extraction of 15% powder was also prepared with CH_3OH for the gas chromatograph. The pH was measured by placing pH test strips in the DI extraction fluid and comparing the color on the strips to the pH color chart.

An analytical test was performed to confirm the presence of carbonate by placing one drop of hydrochloric acid onto 0.05g of the powder from inside of the emitter.

The German VIA test was performed using all three of the emitters for a single test. It was not performed in triplicate due to the quantity of the samples.

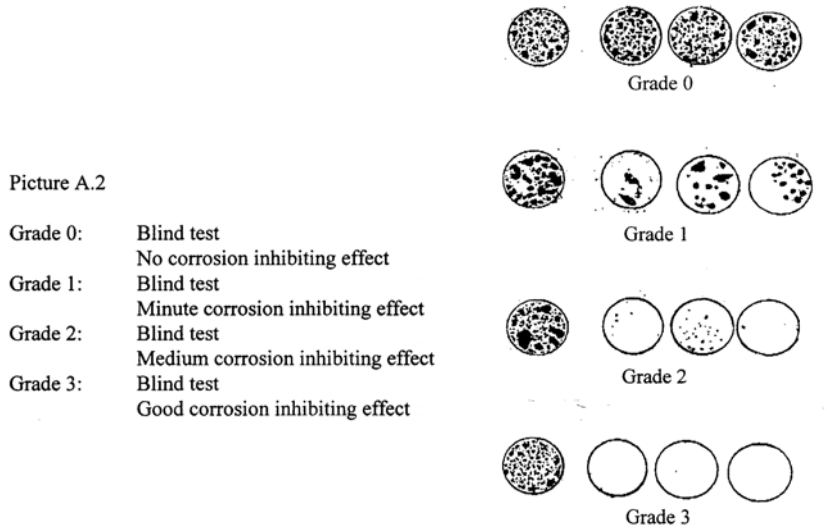
Results:

German VIA Test

Material	Plug #1
VAPPRO 5 Emitter (I)	Grade 1
VAPPRO 5 Emitter (II)	Grade 1
VAPPRO 10 Emitter	Grade 1
VCI Emitter (Cortec) *	Grade 3
Control	Fail

*Typical results for Cortec VCI emitter

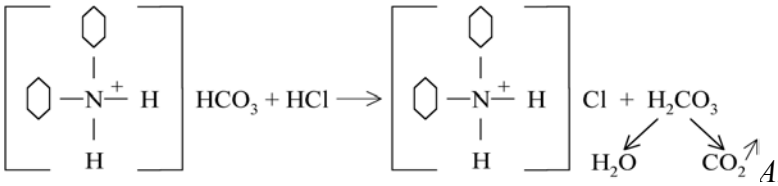
German VIA Test Grades



Gas Chromatography/Mass Spectroscopy: According to the attached chromatograms and the spectra, the powders from all three of the emitters contain a salt of cyclohexylamine and inorganic acid and benzotriazole.

pH Test: The pH of the extract from the powder was ≈ 8-9.

NO_2/NO_3 Test: The sample did not contain nitrite or nitrate.



Analytical Test: When the hydrochloric acid was placed on the powder, a reaction occurred (gas was released from the powder, which was probably

CO_2).

Conclusions: According to the results obtained from the gas chromatograph, the samples contain salt of cyclohexylamine and inorganic acid and benzotriazole.

The following information supports these results:

1. The gas chromatogram results did not reveal any peaks of organic acids.
2. Most of the powder from the sample was soluble in DI water, and the pH of the extract was alkaline (≈ 8-9).
3. The reaction of the hydrochloric acid with the powder showed that the sample is probably cyclohexylammonium carbonate.

The emitters did not provide adequate vapor corrosion protection. One explanation for this could be that cyclohexylammonium carbonate is hygroscopic, dissolving in the water it absorbs under humid conditions and then draining or soaking away from the metal surfaces, leaving the unprotected.

Project #: 00-017-1725

SODIUM NITRITE, 5.1, UN1500, PGIII, OXIDIZER/TOXIC

98%-120 MESH Lot No: **NANI-03-171**

RQ: 100(45.4) Net Wt. **50 LBS.**

CAS#: 7632-00-0 RTECS#: RA 1225000

FW: 69.00 MERK INDEX: 9,8407

Emergency Contact: CHEMTREC:1-800-424-9300

CHEMTREC INTERNATIONAL: (703) 527-3887

HEALTH HAZARADS & FIRST AID:
MATERIAL IS DANGEROUS IF INHALED! IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNT OF WATER, FOR AT LEAST 15 MINUTES IN CASE OF CONTACT EXPOSURE. MATERIAL IS IRRITATING TO THE MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT. EXPOSURE
SYMPTOMS MAY INCLUDE - BURNING SENSATION, COUGHING, WHEEZING, SHORTNESS OF BREATH, HEADACHES, LARYNGITIS, NAUSEA AND VOMITING, DIURESIS, ANEMIA, METHEMOGLOBINEMIA, NEPHRITIS, GASTROENTERITIS AND VASODILATION. IF MATERIAL HAS BEEN INHALED, REMOVE SUBJECT TO FRESH AIR. IF SUBJECT IS NOT BREATHING GIVE ARTIFICIAL RESPIRATION - PREFERABLY MOUTH-TO-MOUTH. IF BREATHING IS DIFFICULT OXYGEN SHOULD BE SUPPLIED. CONTAMINATED CLOTHING SHOULD BE REMOVED AND THOROUGHLY CLEANED BEFORE REUSE. CALL A PHYSICIAN! WASH THOROUGHLY AFTER HANDLING.

INCOMPATIBILITIES: ACIDS, ACID ANHYDRIDES, FUELS, (REDUCING AGENTS). EXPLOSIVE MIXTURES MAY RESULT FROM IMPROPER HANDLING!

PRODUCTS OF DECOMPOSITION: OXIDES OF SODIUM AND NITROGEN.

HANDLING & STORAGE: APPROPRIATE OSHA/MSHA APPROVED RESPIRATOR, CHEMICALLY RESISTANT GLOVES, CHEMICAL GOGGLES AND OTHER APPROPRIATE PROTECTIVE CLOTHING (RUBBER APRON OR OVERWEAR)SHOULD BE WORN. MECHANICAL EXHAUST IS REQUIRED. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. DO NOT BREATHE DUST. AVOID PROLONGED AND REPEATED EXPOSURE. HYGROSCOPIC. KEEP CONTAINERS SEALED. STORE IN COOL DRY PLACE. OBSERVE PROPER PERSONAL HYGIENE. SAFETY SHOWER SHOULD BE AVAILABLE. THE PREFERRED FIRE EXTINGUISHING MEDIA IS WATER, DRY CHEMICAL POWDER, CARBON DIOXIDE OR POLYMER FOAM. MATERIAL IS NONCOMBUSTIBLE. PROTECTADJACENT AREA!

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