

Evaluation of Corrosion Protection of Five Films from Korea

Background: Michael Jang/Cortec Korea submitted five different polymer films to Cortec Corporation in St Paul, MN. Sample A is labeled as Cortec Korea, Sample B is non labeled, Sample C is labeled as Taelim, Sample D is labeled as Seobong and sample E is non labeled. An evaluation is sought on the contact and vapor phase corrosion inhibiting ability of these five films.

Purpose: Evaluate the contact and vapor phase corrosion inhibition of samples A,B,C,D and E.

Method: Razor Blade Test
 VIA Test
 Nitrite Test

Materials: Razor Blade Test Kit
 VIA Test Kit
 EM Quant Nitrate/Nitrite test strips (Lot OC398325, Exp Nov 05)
 Film sample A labeled as Cortec Korea
 Film sample B non labeled
 Film sample C labeled as Taelim
 Film sample D labeled as Seobong
 Film sample E non labeled

Procedure: The above tests were performed according to standard procedures for each.

Results:

Razor Blade Test

Material	Panel #1	Panel #2	Panel #3
Film A	Pass	Pass	Pass
Film B	Pass	Pass	Pass
Film C	Pass	Pass	Pass
Film D	Fail	Fail	Fail
Film E	Fail	Fail	Fail
Cortec VpCI-126 Film*	Pass	Pass	Pass
Control	Fail	Fail	Fail



VIA Test

Material	Plug #1	Plug #2	Plug #3
Film A	Grade 0	Grade 0	Grade 0
Film B	Grade 1	Grade 1	Grade 1
Film C	Grade 0	Grade 0	Grade 0
Film D	Grade 0	Grade 0	Grade 0
Film E	Grade 0	Grade 0	Grade 0
Cortec VpCI-126 Film*	Grade 3	Grade 3	Grade 3
Control	Fail	Fail	Fail

*Typical results for Cortec VpCI-126 film

Nitrite Test: Film sample A, is non nitrite based
 Film sample B appears to contain a significant amount of nitrite
 Film sample C is nitrite based
 Film sample D is non nitrite based
 Film sample E is non nitrite based

Conclusion: Film sample A, (containing Cortec M-126) is not providing vapor phase corrosion inhibition. From FT-IR analysis, film sample A appears to have sufficient Cortec M-126, to provide vapor phase corrosion inhibition. The only one difference between Film A and Cortec's VpCI-126 is a basic resin used. The failure of Film A in VIA test could be explained by the use of the resin with the structure, which doesn't allow VpCI to be released from the resin surface. Sample B provides contact phase corrosion inhibition and insufficient vapor phase corrosion inhibition. Lack of amount of sample B provided, prevented an FT-IR analysis. Sample C is nitrite based, and appears to contain a benzoate. Sample C provides only contact phase corrosion inhibition and no vapor phase corrosion inhibition. Sample D and E contain absolutely no corrosion inhibitors according to FT-IR analysis, and provide no contact or vapor phase corrosion inhibition.

Project #: 03-229-1125

Estimated Cost of Project: 3 hours

To: Michael Jang/Cortec Korea

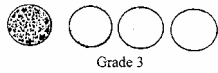
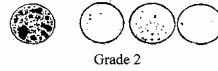
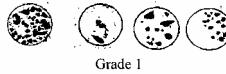
From: Bob Berg

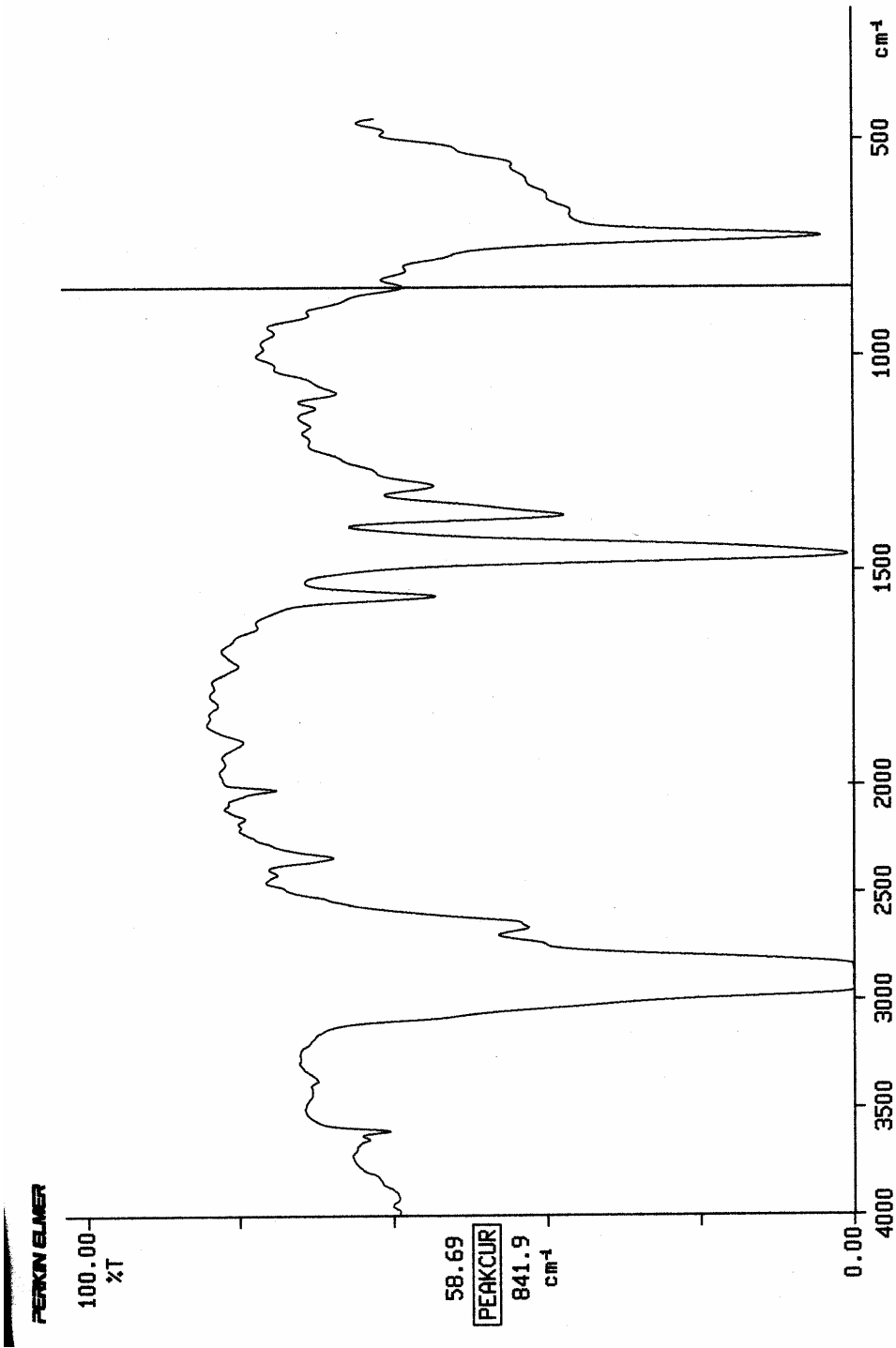
Date: 12/19/03

cc: Boris Miksic
 Anna Vignetti
 Art Ahlbrecht
 Rita Kharshan
 Cliff Cracauer
 Vanessa Schultz
 Bob Boyle

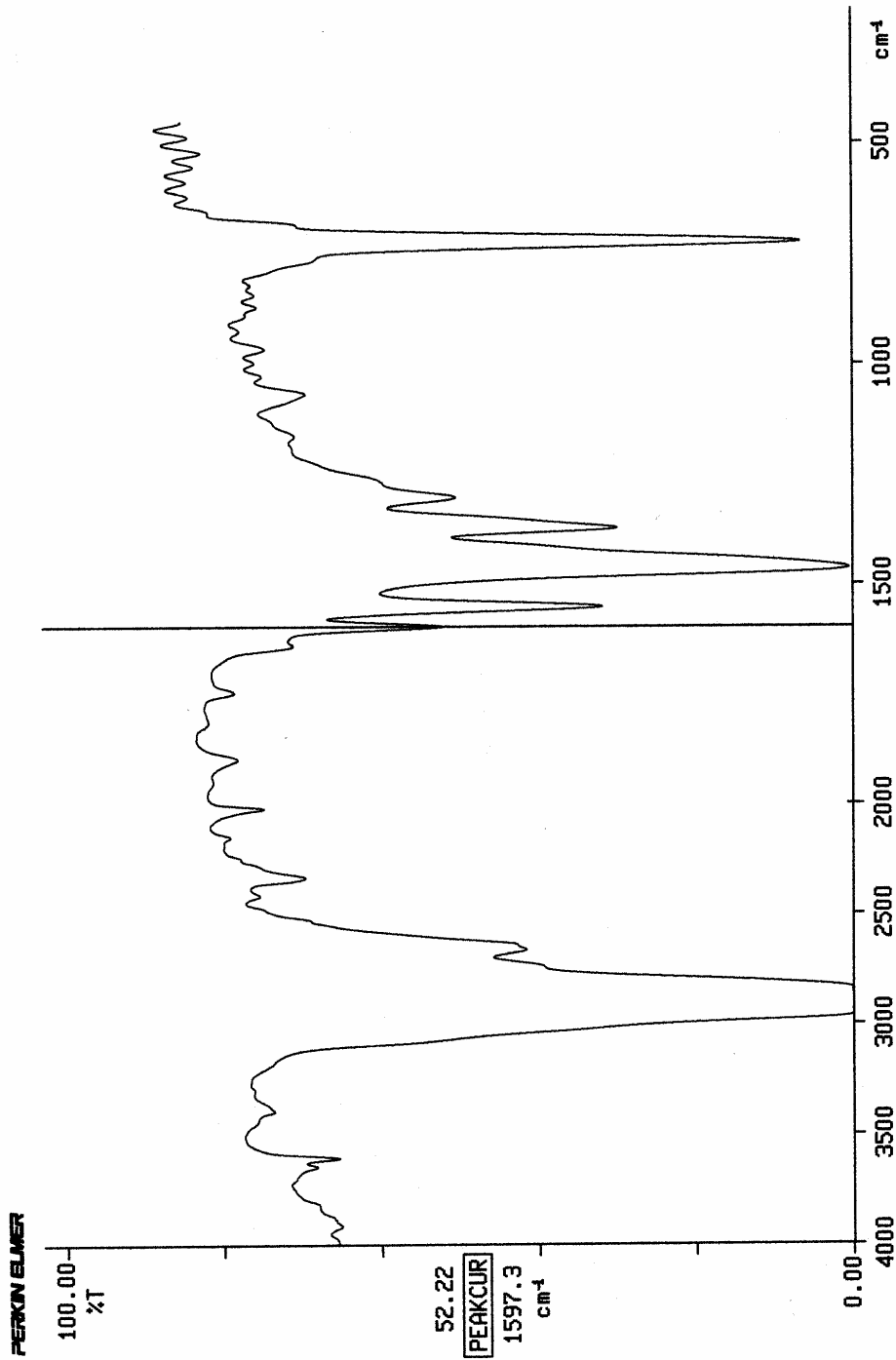
VIA Test Grades (Grade 2 or 3 are passing)

- 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

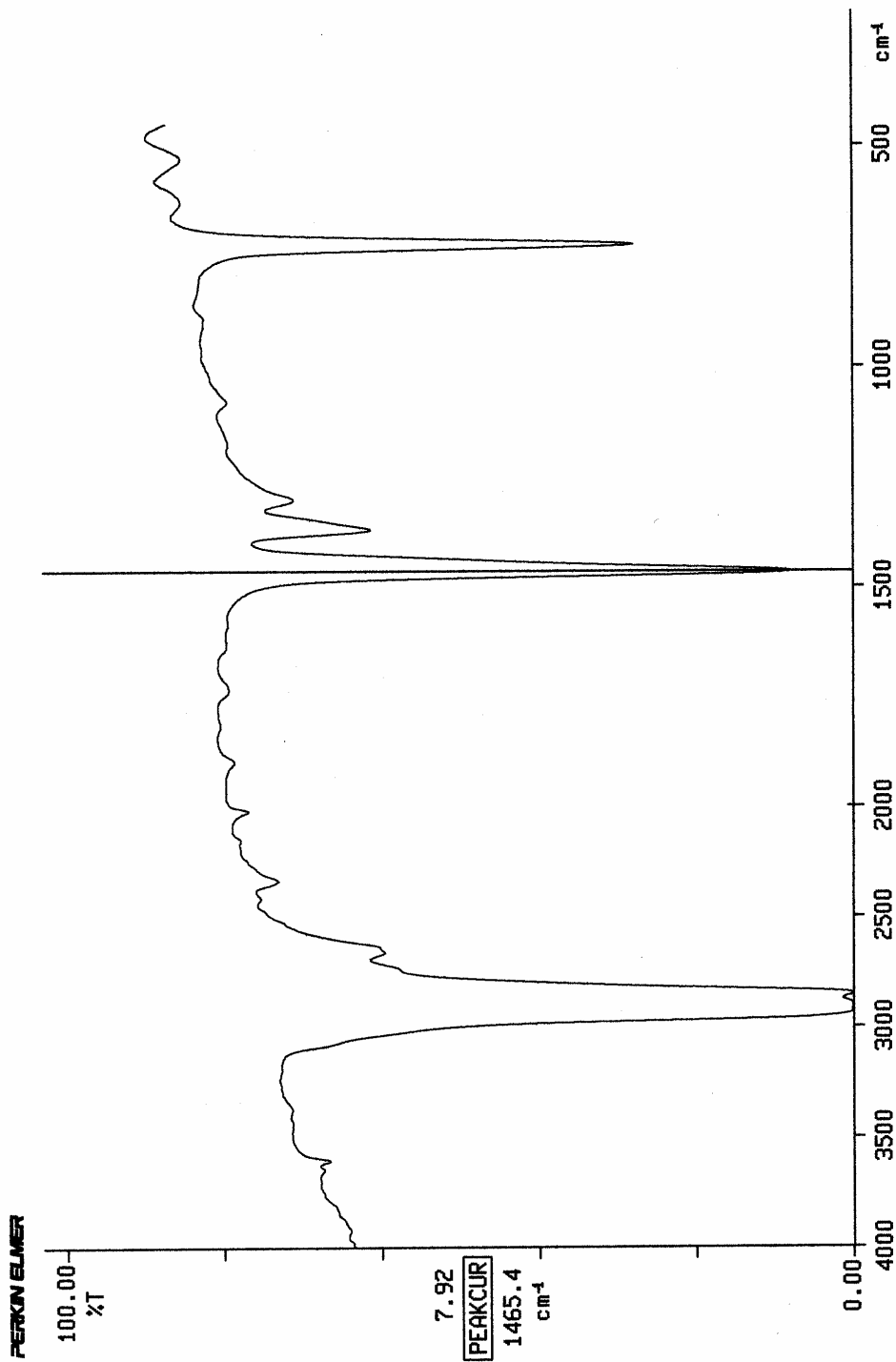




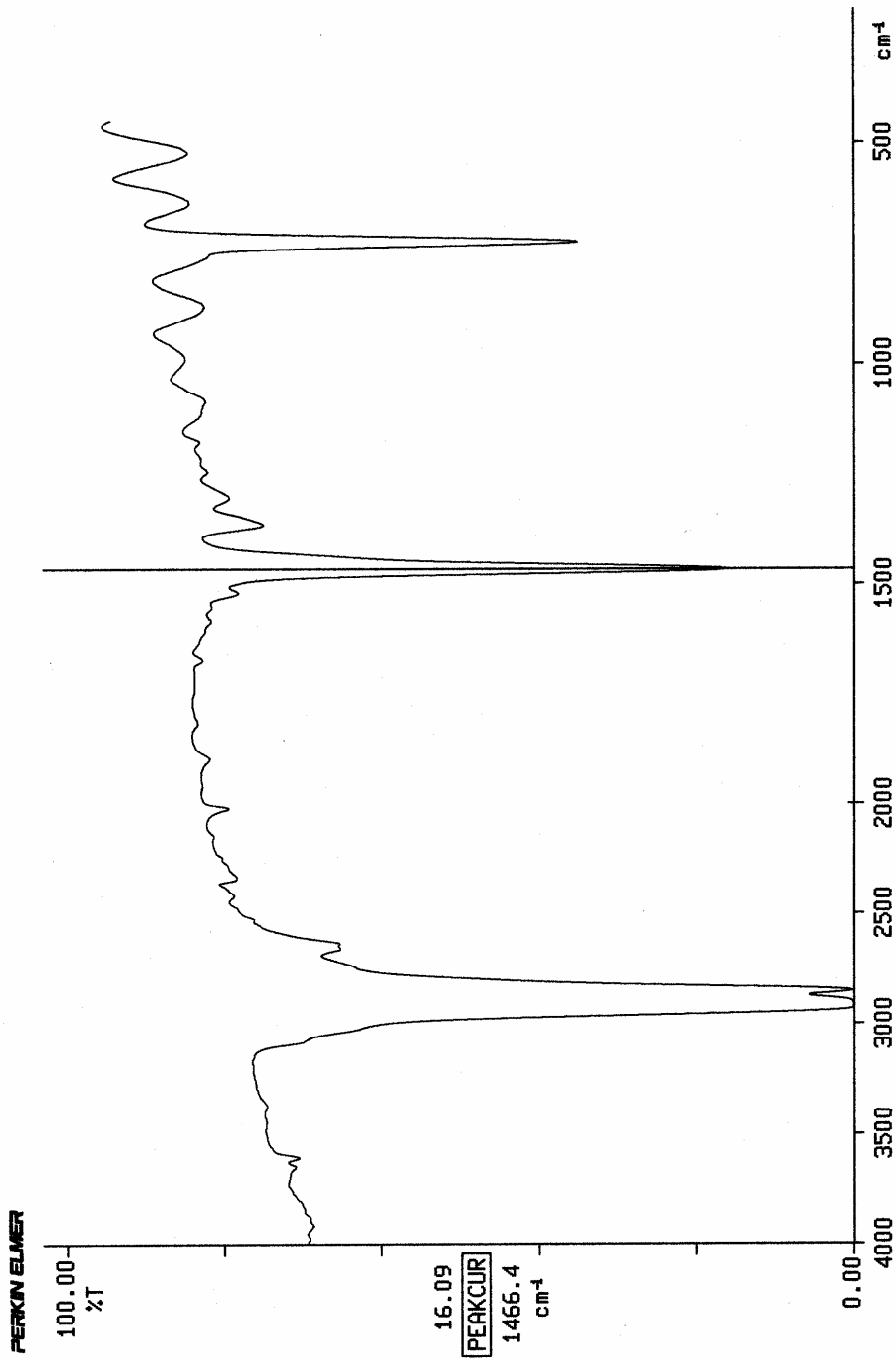
03/12/12 10:23 QA
X: 8 scans, 16.0cm-1
03-229-1125, 4 mil, A



03/12/12 10:27 QA
X: 8 scans, 16.0cm⁻¹
03-229-1125, 4 mil, C



03/12/12 10:31 QA
 X: 8 scans, 16.0cm⁻¹
 03-229-1125, 2 mil, D



03/12/12 10:34 QA
X: 8 scans, 16.0cm-1
03-229-1125, 1 mil, E