

The Use of Ion Chromatography (IC) in the Printed Circuit Board Industry



Keith M Sellers
Senior Scientist
Trace Laboratories – East



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Abstract

- Ionic cleanliness is an extremely important aspect in design, fabrication, and construction of PCA's
- Cleanliness testing has evolved
- Test methods using Ion Chromatography have been developed by the printed circuit board industry, as well as by the military and the automotive industry
- The use of IC in "today's" industry

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Cleanliness Concerns ...

- Printed circuit assemblies fail (typically) not because of ...but because of ...
- As construction technology advances are made ...
- Contamination comes from anywhere and everywhere ...
- Pay now or pay later ...

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Evolution of Cleanliness Testing

- Resistivity of Solvent Extract (ROSE)
 - Dynamic vs. Static Method
- Ion Chromatography Analysis of ...
 - Adhesives
 - Components
 - Fluxes
 - Pastes
 - Printed Circuit Assemblies (PCA)
 - Printed Circuit Boards (PCB)



IC per IPC Methods

- IPC-TM-650, method 2.3.28 – Ionic Analysis of Circuit Boards, Ion Chromatography Method
 - PCB's & PCA's
 - Sealed bags
 - 75/25 v/v IPA/DI
 - 1 hr, 80 C extraction
 - Suggested list of anions, cations, and weak organic acid anions
- IPC-TM-650, method 2.3.28.1 – Halide Content of Soldering Fluxes and Pastes
 - Liquid Flux
 - "Dilute 'n' Shoot"
 - Solder Paste
 - 10/90 v/v IPA/DI
 - 16 hrs, 80 C extraction
 - Cored Wire
 - "Test Tube" extraction

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IC per Military Methods

- MIL-STD-883F, method 5011.4 – Evaluation and Acceptance Procedures for Polymeric Materials
- Section 3.5.4 – Ionic Impurities
 - pH, Total Ionic Content, and Specific Ion Content
- Polymeric Materials used in Microcircuit Apps
 - Electrically Conductive and Electrically Insulative
- DI reflux extraction for 20 hrs
- Requirements for Cl, Na, K, and F
- Also pH and electrical conductance requirements

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IC per Delphi Delco Methods

- Q-1000, method 119 – Surface Ion Contamination
 - Contains procedures for ROSE and IC
 - “Component” samples
 - Sealed bags
 - 10/90 v/v IPA/DI
 - 1 hr, 80 C extraction
 - Requirements for Cl, Br, “Na + K”, and “Total Inorganic Ions”
- Q-1000, method 127 – Surface Ionic Contamination
 - Contains two (2) procedures for ROSE and IC
 - PCB’s & PCA’s
 - Sealed bags
 - 10/90 v/v IPA/DI or DI
 - 1 hr, 80 C extraction or 10-30 mins, 80 C

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Uses of IC in Industry

- “Proactive” Approach
 - Continuous Process Control
 - “Spot” Checks
 - Product Qualification Program
- “Reactive” Approach
 - Contamination Analysis
 - Surface Insulation Resistance (SIR) Testing
 - Electromigration (EM) Testing
 - Failure Analysis

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Questions IC Can Answer

- Am I clean?
- How clean am I?
- Is my cleaning process improving?
- Why did I fail?
- What's the source of the contamination?
 - Acid etch?
 - Flux residue?
 - Handling?

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Conclusions / Observations

- IC can provide a significant amount of information about a printed circuit board's / assembly's history
- IC is a great tool in determining possible root causes of failure for an assembly / finished product
- The use of IC in the analysis of printed circuit assembly "components" continues to expand
- As technology advances to more "micro" electronics, engineers will need to become more aware of the benefits of IC testing