

## **Analytical Techniques to Identify Unexpected Contaminants on Electronics Assemblies**

Particulates and other contaminants on an electronic assembly or its related components can have a devastating effect on system integrity. It is essential that these materials are rapidly isolated, identified and removed so that corrective steps can be taken.

With a variety of examination and testing equipment, STI's Analytical Lab is equipped to evaluate both particulate and amorphous contaminants through Ion Chromatography (IC), Scanning Electron Microscopy with Energy Dispersive Spectroscopy capability (SEM/EDS), and Fourier Transform-Infrared Spectroscopy (FTIR).

### **Ion Chromatography**

Generally a safe, non-destructive process when performed in accordance with the appropriate regulations, IC testing accurately detects and quantifies even minute amounts of cations, anions and weak organic acids. Suggested ionic contamination levels are listed below. (Chart does not include fluoride, malate, calcium, and magnesium, all of which are also detected through IC testing.)

<b><u>Anions</u></b>	<b><u>Washed Samples</u></b>	<b><u>No Clean Samples</u></b>
Chloride	<6	<3-5
Nitrate	<3	<3
Sulfate	<3	<3
Bromide	<10	<10
Nitrate	<3	<3
Phosphate	<3	<3

  

<b><u>Weak Organic Acids</u></b>	<b><u>Washed Samples</u></b>	<b><u>No Clean Samples</u></b>
Acetate	<3	<3
Formate	<3	<3
MSA, Adipic, Succinic	<25 Total	<125

  

<b><u>Cations</u></b>	<b><u>Washed Samples</u></b>	<b><u>No Clean Samples</u></b>
Lithium	<3	<3
Sodium	<3	<3
Ammonium	<3	<3
Potassium	<3	<3

*Recommended levels of contamination in  $\mu\text{g}$  of ion per  $\text{in}^2$  of surface area.*

### **SEM/EDS**

Designed to offer an elemental analysis for contamination of unknown origin, EDS is often a critical first step in identification of elements, as well as their concentration. ESD analysis will reveal a substance as metallic, metal oxide or organic; however, organic substances must undergo additional testing using FTIR methods.

## **FTIR**

As opposed to IC testing, which offers quantitative analysis of cleanliness or contamination, FTIR testing offers qualitative analysis of visible organic contamination. Generally non-destructive, FTIR testing requires a spectrum of the unknown substance which is then compared against a database of spectra from previously identified substances. Most often this reference will provide a close match, and occasionally a contaminant can even be matched to a specific brand of flux or other chemical substance. The material in question can also be compared to known substances applied during the assembly process to ensure definitive identification of the contaminant.

## **A Range of Tools for Complete Analysis**

To accurately identify contamination source, several tools are available.

- IC Testing – best used to gauge board cleanliness and identify potentially harmful ions
- EDS and FTIR – methods which can be combined to offer definitive identification of visible contamination and possible sources of contaminants

By accurately identifying and quantifying contaminating substances, we can vastly enhance reliability and longevity of our electrical assembly components.

*This article is based on an original publication by STI.*