An Alternative Screening Method for the Detection of RoHS Substances

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Alternative screening methods which are rapid and accurate have been sought by the electronics and semiconductor industries to ensure compliance with the European Union Directive 2002/95/EC. The European RoHS (Restriction on Hazardous Substances) directive bans the use of certain materials such as lead, mercury and cadmium, in electronics products built anywhere in the world and sold on the EU market beginning July 1, 2006. Currently accepted methods for analysis include wet chemical processing techniques which, although accurate, can be time consuming and labor intensive. Quick screening methods such as X-Ray Fluorescence (XRF) have taken center stage due to their ease of use and sensitivity at the risk of lower accuracy as compared to wet chemical methods.

Alternative Method

An alternative method which is being developed makes use of Laser Ablation Inductively Coupled Plasma Mass Spectroscopy (LA-ICP-MS or SARIS™). This technique relies on a high power UV laser to instantaneously volatilize the sample surface. The volatilized material is carried in an inert gas stream and introduced into the plasma of the ICP-MS system for subsequent detection of elemental species. One advantage of this technique is that the time consuming sample preparation technique is eliminated allowing rapid sample analysis. Another advantage of SARIS is its ability to control depth of the analysis by varying the laser power density or performing additional ablation of the area of interest, permitting the determination of changing elemental concentration with depth (depth profiles) as deep as 100 mm.

Metals	**Solder Balls**
Alloys	**Bonding Wires**
Polymers	**Inks**
Adhesives	**Package Leads**
Natural Products	**Packaging Material**
Laminates	**Insulators and Ceramics**

SARIS™ also retains the benefits of ICP-MS to accurately quantify elements at the required specification limits through the use of NIST traceable standards, and even to a 10 to 1 ppm range for the method detection limit. A bonus of this analysis is that the concentration of any filler compounds or additives may be monitored as a by-product of the RoHS analysis. Analyses may be performed on any variety of solid materials, as shown in Figure 1. The lateral dimensions of the analysis area may be varied from as large as several millimeters to spots as small as 10 mm.

Case Study

SARIS™ analyses of the solder mask samples from two different vendors were performed to determine the elemental constituents present and whether the materials were RoHS compliant. The blue solder mask was found to be compliant due to the absence of any RoHS substance. The green mask, on the other hand, indicated the presence of bromine. Depending on the concentration of bromine, additional wet chemical analysis may need to be performed to determine if the compounds present were members of the banned PBB or PBDE materials. The graphs in Figure 2 show the bromine peak in the green mask, and the noticeable absence of RoHS banned elements (lead, cadmium, mercury and chromium) in both graphs.◆

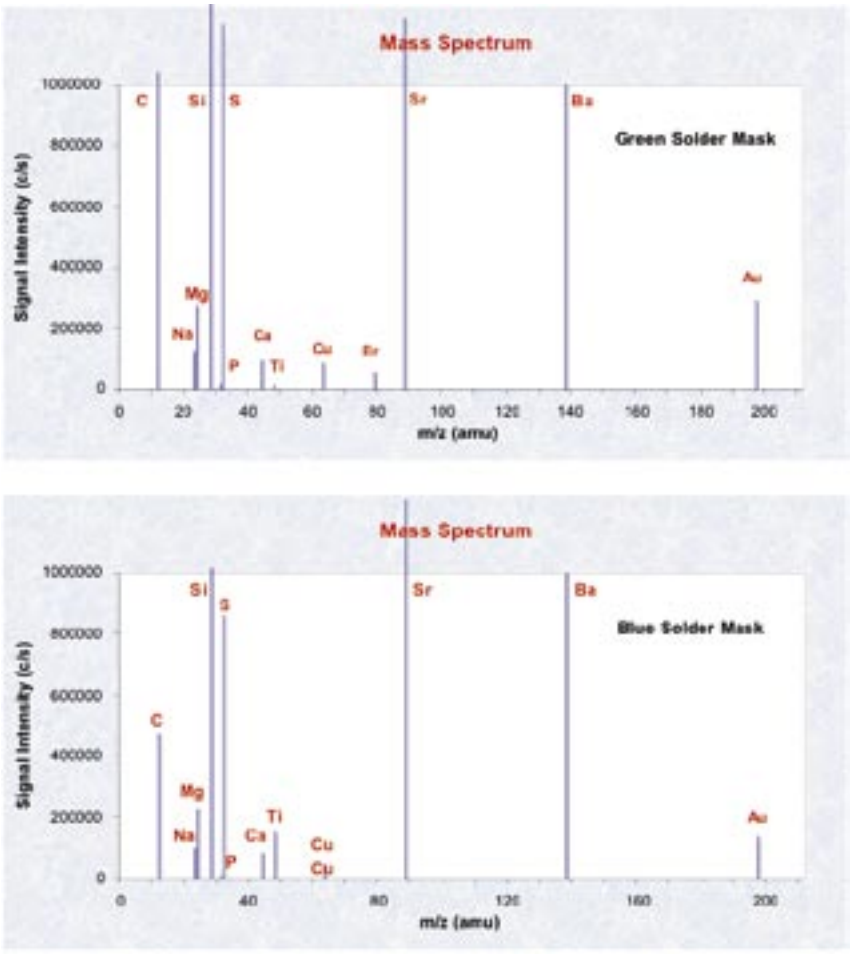

Figure 2: Comparison of PWB Solder Mask Thin Films from Different Vendors.