MATERIALS ANALYSIS WITH HANDHELD XRF FOR COMPLIANCE WITH ROHS AND WEEE DIRECTIVES – OPPORTUNITIES AND CHALLENGES

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Since July 2006, the world industry is working towards compliance with the European Union RoHS and WEEE Directives for electrical and electronic products. The RoHS (restriction of hazardous substances) Directive\(^1\) calls on manufacturers to not use in their products any materials, parts or subassemblies that contain more than 1000 mg/kg each of mercury (Hg), lead (Pb), hexavalent chromium (Cr\(^{+6}\)), polybrominated diphenyls (PBD) and polybrominated diphenyl ethers (PBDE), and more than 100 mg/kg of cadmium (Cd). The WEEE (waste electric and electronic equipment) Directive\(^2\) mandates manufacturers to collect and properly recycle products that enter the market, so that as little waste as possible ends up in landfills. The regulations have worldwide impact as other major countries and economies (China, Korea, Japan, US, Latin America) quickly follow the suit with their own.

Testing is one of the key elements of compliance. The industries affected by the RoHS Directive quickly realized the difficulty of testing materials and products for compliance by relaying only on conventional laboratory methods. While looking for solutions the industry recognized the benefits of using XRF for testing and embraced this technique as a first line of defense against noncompliant components and materials. A core section of this presentation is devoted to discussion of how and when the EDXRF may be used as an analytically sound and cost effective tool in the program of compliance testing. Specifically, we will focus on nondestructive feature of XRF analysis, elevated to a new level by handheld XRF analyzers. We will show that tube-excited handheld XRF analyzer offers minimum detection limits on the order of 3 to 15 mg/kg for the RoHS elements, and that it can be used for rapid screening of materials for presence of brominated flame retardants and solders for presence of lead.

While it is true that the XRF method cannot distinguish trivalent from hexavalent chromium, it will nevertheless report the total chromium concentration, which is conclusive information if the reported value is below the threshold level. Similarly, XRF can only measure total bromine concentration in brominated flame retardant. However, the very fact that the instrument can assert the absence of bromine may be sufficient to avoid costly follow-up tests specific for brominated compounds. By design all electronic products are heterogeneous which presents additional challenges for XRF analysis. Numerous, real life examples will illustrate how one may successfully deal with them.

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