

# Choosing XRF for RoHS Applications

James R. Bogert  
Matrix Metrologies, Inc.  
Holbrook, NY 11741 USA

Although no one analytical instrument technique is capable of completely satisfying all RoHS validation requirements, X-ray Fluorescence (XRF) Spectroscopy is the most versatile, capable of analyzing all the restricted elements with no sample prep and in most cases, nondestructively.

Of the two instrumental approaches to XRF analysis, Energy Dispersive XRF (EDXRF) and Wavelength Dispersive XRF (WDXRF), EDXRF has been most widely adopted for RoHS analysis. This is due to the ability of EDXRF to inspect samples of widely varying shapes and sizes. Of the EDXRF instruments commercially available handheld XRF and bench-top micro-beam XRF systems have proven the most applicable.

Because RoHS level analysis (1000ppm Pb, 1000ppm Hg, 1000ppm Cr<sup>+6</sup>, 1000 ppm Br as PBB and PBDE, and 100 ppm Cd)<sup>1</sup> is trace analysis from an EDXRF perspective, EDXRF detection limits are ppm levels, equipment used for RoHS inspection and validation require 2 important hardware features to enable this kind of analysis. These are a solid-state detector for peak resolution and incident X-ray beam filtration to provide the necessary peak-to-background (signal-to-noise) response. Both handheld and bench-top units may offer these features. So, how does one decide between a handheld and a bench-top unit? As is usually the case, it depends on the form of the samples and the analytical requirements and expectations. And in some cases you may want to consider both.

This paper will speak to X-ray spectrometer features and capabilities – hardware and software that should be considered when choosing EDXRF (Handheld and / or Bench-top) for RoHS applications, including:

1. Analysis area – incident spot size and beam collimation.
2. Is the analysis area vertically homogenous, ie., is it a plated material, in which, case thickness must be accounted for with thickness and composition software.
3. If it is vertically homogenous, is the sampled area infinitely thick to analyte emission, ie., Cd in plastic? Again, if not then thickness must be part of the analysis.
4. Is the sample horizontally homogeneous, ie., a populated printed circuit board? How does the analyst sample this?

XRF RoHS applications are complicated and present many gray areas that should be addressed when choosing and implementing an X-ray instrument and reporting the results.

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<sup>1</sup> XRF provides total elemental content it does not differentiate between Cr+3 and Cr+6 or the molecular state of Br.