IMPROVED BEAM COLLIMATION IN PORTABLE XRF ANALYZER FOR ANALYSIS OF SMALL ELECTRONIC COMPONENTS

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Abstract
Field Portable XRF Analyzers are well established in alloy industries as the best tools for positive materials identification and sorting. Environmental professionals use such instruments routinely for soil screening for heavy metals. The proven robustness and good analytical performance of these instruments attracted attention of other industries as well. As the result of pending RoHS Directive electronic industry has been very much interested in analysis of a variety of small and much diversified parts and components.

Portable XRF analyzer offers more than adequate analytical performance of nondestructive testing combined with a high throughput. However, all contemporary portable XRF analyzers use a “broad beam” geometry which is a handicap when small, surface mount components are to be analyzed. To perform analysis on such small objects the primary beam of x-rays should be confined to a spot that, when projected on sample surface, would not be greater than 2 to 3 mm in diameter. The existing capillary optics while most desirable, are too expensive and too large for portable systems, and cover the energy range of only up to 25 keV. An alternative method of “focusing” the x-ray beam is its collimation with appropriate system of apertures/collimators.

In this paper we report on the design of a portable x-ray analyzer with improved primary beam geometry which illuminates less than 3 mm diameter spot on sample surface. The analyzer is also equipped with miniature, built-in camera and LED, which allow for exact positioning of the x-ray beam on the investigated object. Performance of this instrument is compared with that of the analyzer using “broad-beam” geometry. The benefits of the use of collimated beam geometry are illustrated by examples of analysis of small and miniature electronic parts, and other objects.