

## QUANTITATIVE ANALYSIS USING MICRO X-RAY FLUORESCENCE

George J. Havrilla, Los Alamos National Laboratory, Los Alamos, NM

The power of micro X-ray fluorescence can be realized by utilizing not only the qualitative capabilities of spatially resolved identification of elemental composition but quantifying the amount of the analyte element present. This includes both single point and elemental image analyses. Single point analysis is simply an extension of bulk quantitative analysis. This approach can be enhanced in MXRF analysis by utilizing the dried spot method of quantification. This novel sample preparation method employs the bulk analysis capabilities of XRF with high sensitivity achieved through both background reduction and signal enhancement. Detection limits around 1 ng/mL can be achieved. Examples, along with the advantages and disadvantages of single point MXRF analysis will be presented demonstrating high sensitivity single point elemental analysis.

The full potential of MXRF quantitative capabilities is realized in spatially resolved elemental image analysis. Two approaches will be demonstrated utilizing images for quantification: 1) a minor component in a metal alloy and its heterogeneous distribution and 2) a metal in an ash sample. The metal alloy is a simple binary system, however the area imaged and subsequently quantified is about 10 x 10 cm. Sensitivity for this image quantification is less than 0.5%. The ash sample is unique in that the mass of the ash is less than 0.1 g. The ash sample is pelletized and we use elemental imaging of the pellet to collect two kinds of information: 1) observe the heterogeneous distribution of the element in the pellet and 2) obtain the bulk elemental composition. This is achieved by using the composite spectrum obtained from the pellet image. The analyte intensity is proportional to the total pellet content. We have achieved linear calibration for the analyte element and have analyzed unknowns using this procedure.