

APPLICATIONS OF CONFOCAL MICRO X-RAY FLUORESCENCE 3-DIMENSIONAL ELEMENTAL IMAGING

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Confocal micro X-ray fluorescence (CMXRF) offers a new paradigm in materials characterization. CMXRF utilizes monolithic polycapillary optics on both the excitation and detection paths to create an overlap region of the two focal spots. This confocal volume allows XRF elemental information to be obtained nondestructively by moving the confocal volume in 3 dimensions. Although a powerful analytical concept it is still not fully understood within the analytical community.

This paper will explore the use of CMXRF in collecting 3 dimensional information for a variety of samples including a resistor, layered paint sample, an ICF target, and a variety of uranium particles. In each application, the utility of CMXRF is highlighted by providing unique nondestructive 3-dimensional information about the samples. In the case of the resistor, distributions of lead and tin are important for mitigation of tin whisker formation. The layered paint sample offers a new perspective for potential art conservation applications. Simple depth profiles are only single point while a CMXRF scan can show the texture of the applied paint as well. The ICF target is an ideal sample of light material with transition element dopants as well as contaminants. The key feature in this case is obtaining elemental information nondestructively. Finally a 3D map of an array of uranium particles offers insights into 3D spatially resolved detection of particles. Particle sizes ranging from 10 to 100 micrometers are captured in a volume 1 x 1 x 0.4 mm.

Scanning parameters as well as insights into the 3D elemental structures of these samples will be presented.