

Development Of A Large-Format Mapping XRF System

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Automobiles rely on a diverse set of materials that are often in the form of large, complex parts. Characterizing elemental composition using XRF is common, but spatial mapping of composition typically relies on tedious sampling to accommodate spectrometer sample cups, or repeated measurements with a low-resolution handheld spectrometer. High-resolution mapping is often accomplished using a SEM-EDS, but this technique is very limited in the acceptable sample size and in many cases, sampling is not allowed or practical.

A large-format mapping XRF is under development at Ford Motor Company's Research and Innovation Center that can accommodate parts up to 1.2 x 1.2 meter in the x-y plane and 0.3 meters in the z-direction. This system is being built using an off-the-shelf CNC router Cartesian robot with an attached low-power X-ray tube and SDD detector. Operation of the robot is through conventional control software (G-code) and data are analyzed and compiled using the Open Source PyMCA software. In addition to mapping over large areas, the system is designed to allow for advanced optics that can provide small (50 micron) spot measurements, and can accommodate multiple accessory attachments to facilitate a complete component analysis. We will report on the design intent, the sourcing of components and the progress to-date, along with representative XRF measurement to illustrate the capability of the system.

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