



## **The rapid development of handheld x-ray fluorescence analyzers into a wide-spread essential field analysis tool for geological and environmental applications**

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Truly handheld XRF analyzers for environmental analysis (as opposed to their relatively bulky field portable predecessors) really emerged in the mid 1990's as instrumentation capable of providing value to industry. However, there were limitations relating to limits of detection, detector resolution, internal electronics and the use of isotopes as x-ray generating sources. There was also a general lack of understanding of how these units could be used successfully in the field and work began to develop USEPA accredited methods. Particularly since the advent of miniature X-ray tubes in late 2002 the performance and transportability of handheld analyzers improved dramatically. The latest generations of handheld analyzers feature X-ray tubes with up to 2W and 50kV power output. Combined with advanced signal processing capabilities, multiple primary beam filtration options and power settings, detection limits down to the low PPM range can be achieved. The analytical range spans from Mg to U within different calibration models from empirical to fundamental parameter algorithms. Both the sensitivity and robustness of the calibration models enable the user to perform analyses in the field that were unthinkable just a few years ago. Today, large numbers of instruments are manufactured each year for environmental and geological applications in research, government agencies, geological surveys and mining companies. This discussion will map out the factors that have converged over the last 15 years that now place handheld XRF in the field kit of a fast growing number of soil scientists and geologists who are interested in rapid on-site analysis of geological and environmental matrices.