

Handheld XRD Methods for Forensic Applications

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The author has developed a prototype handheld XRD instrument based on energy-dispersive XRD (EDXRD) in a back-reflection geometry. This technique is not sensitive to sample morphology, allowing crystallographic analysis without any sample preparation¹⁻⁴ for samples which are naturally fine-grained. The prototype instrument has been tested quite extensively for some mining applications (mineralogical quantification of iron ores and limestones) and for a range of the more common metal alloys⁵. While the technique is limited by the low resolution of diffraction peaks and interference by overlapping fluorescence peaks, the advantages of *in situ*, non-destructive and rapid measurement, tolerance of irregular surfaces and no sample preparation requirement are potentially transformative.

In this talk, the application of handheld XRD based on back-reflection EDXRD in forensics is explored. The use of field-portable instruments at the crime scene to make initial assessments is growing rapidly. Although field instruments inevitably have reduced performance relative to their laboratory counterparts, they are typically configured to provide actionable answers⁶ and facilitate fast decision making. One example of their utility is the triage of specimens to be sent for laboratory analysis. The development of handheld XRD methods potentially adds a new capability to crime scene investigations with particular promise for the identification of certain types of material such as explosives and drugs.

References

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